FORMULATING CRITERIA FOR EVALUATING COASTAL MANAGEMENT PROGRAMS

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Prepared for the Office of Coastal Zone Management,
National Oceanic and Atmospheric Administration,
U. S. Department of Commerce

(September, 1976)

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PREFACE

The Federal Office of Coastal Zone Management is concerned with determining techniques for evaluating coastal zone management activities. Ten or 15 years from now, how can answers be given to the following questions: What difference has coastal zone management meant to the people of the country? Is the coastal zone in better or worse shape as a result of those activities?

This report is the result of a nine-week research project conducted during the summer of 1976 to begin addressing aspects of the program evaluation questions. The purpose of the project was twofold. First, to record the coastal zone problems which were identified by key individuals and agencies prior to passage of the federal Coastal Zone Management Act of 1972. And second, the project was designed to articulate a technique for deriving criteria to evaluate coastal management programs by analyzing these problem statements. It is divided into three sections, a summary of the research findings, a discussion of program evaluation, and a 108-page digest of the problem statements extracted from the source material and interviews. This report will be used by the federal Office of Coastal Zone Management and other interested organizations and individuals to initiate thinking into ways program evaluation can be incorporated into the development and implementation of coastal management programs.

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Special thanks to Sid Farcy and Jens Sorensen who assisted in the research and preparation of this report. The time and effort of the interviewees, all of whom were influential in the development of the federal coastal management program, is deeply appreciated.

INTRODUCTION

The purpose of this project is to document and synthesize coastal zone problems as perceived by the individuals and organizations who participated from 1968 to 1972 in the formulation of the present federal coastal zone management program. These problem statements, combined with an examination of the text of the Coastal Zone Management Act of 1972 and its implementing guidelines, the perceptions of state and local coastal officials developing management programs and the views of key coastal zone users, suggest evaluation criteria to judge the present CZM effort. This endeavor should be viewed as a first step in program evaluation.

Statements of problems were extracted from five sources: Congressional hearings; major government reports; proceedings of selected state, regional and national coastal zone conferences held during 1968-72; a sampling of state government documents; and interviews with key participants who were actively involved in the development of the present program.

This data is indexed according to problem and subproblem statements and is presented in digest form with verbatim excerpts taken from the written sources. Problems are grouped under general problem statements that were written to reflect as accurately as possible what was said by the participants and in the reports. Notes from the interviews are presented in paraphrase form, and focus on problem statements and evaluation criteria identified by the interviewees.

The report is divided into the following three sections:

--Coastal zone problems: This section describes why problem statements provide useful criteria for program evaluation. Problems identified in the digest are divided into two groups according to the amount of emphasis each received in the source material. Those receiving primary emphasis are described in more detail. Lastly, the causes of problems are discussed.

--Program evaluation: In this section, the purpose of program evaluation, as well as the different approaches to evaluation, are defined and explained. Evaluation criteria are suggested for coastal problems discussed in the previous section and a method is presented for linking together different problems and criteria in evaluation. Past evaluation efforts in coastal zone management are reviewed to note progress made in the field to date. Next, different levels of program evaluation are described and differentiated. And finally, the report suggests future steps for program evaluation in coastal zone management.

--Digest: The problem statements are presented in the following manner:

--Table of contents for digest

--Index of problems and subproblems

--Index of individuals and organizations quoted

--Bibliography of published sources used in digest

--Digest of problems (arranged by individuals and organizations quoted)

--Index of interviews

--Interviews.

COASTAL ZONE PROBLEMS

Before presenting the findings of the research, it is important to explain why we chose to look at problem statements as a means of formulating criteria from which to evaluate coastal management programs. Evaluation criteria articulates what coastal zone management should be achieving. These normative standards can be derived from several sources: (1) policies and goals expressed in the 1972 Coastal Zone Management Act; (2) program objectives delineated by Office of Coastal Zone Management guidelines; (3) attitudes and observations of participants currently involved in coastal management, and (4) problems articulated during the years from 1968 to 1972 that led to the passage of coastal legislation by Congress. While all four provide important sources of information, we have chosen to focus on the fourth area, because it provides a richness of detail not found in either implementation guidelines, or in the often cursory and ambiguous statements of policies and goals in the federal and individual state coastal acts. And, perhaps most importantly, program evaluation efforts using criteria derived from problem statements can determine if coastal programs are alleviating pressing coastal problems.

What follows is a summary of the digest, which presents key coastal problems perceived prior to passage of the CZMA. These problems are separated into two distinct categories. The first, resource outcome problems, are dissatisfactions with a natural resource state. The second, organizational process problems, are those deficient characteristics or procedures which inhibit an organization from attaining its

goals and objectives. The 24 coastal zone problems we identified through the literature and interviews are as follows:

Resource Outcome Problems

**1. Intense use conflicts among competing uses

*2. Increasing population growth with residential, commercial, and industrial development pressures

**3. Extensive environmental pollution

*4. Destructive dredging, filling, and bulkheading

**5. Destruction of coastal habitat and degradation of fish and wildlife resources

*6. Limited public access and recreational opportunities

7. Aesthetically displeasing development

8. Damage to shoreline environment and development from erosion and other natural phenomena

9. Inadequate economic development

10. Boating and navigation hazards

Organizational Process Problems

**11. Lack of coordination among public agencies

**12. Insufficient planning and regulatory authority

13. Complex, conflicting, and confusing laws

14. Little awareness or concern with coastal problems

*15. Lack of clearly stated goals

**16. Insufficient data base and lack of information for decision-making

**17. Little understanding or knowledge about coastal ecosystems

*18. Primitive analytical tools and predictive methodologies

*19. State and local governments do not have the funds to adequately manage the coastal zone

20. Lack of properly trained and educated management personnel

21. Dominance of short-term management over long-range planning

**22. Resource decisions are made primarily on the basis of economic considerations to the exclusion of ecological considerations

23. Limited public participation in decision-making

24. Environmental regulations stifle economic enterprise

By grouping similar statements and noting their frequency and the emphasis they received in the documents and interviews, we were able to divide the problems into general categories of importance. Eight were clearly predominant (**). Fifteen of the 24 problems can be singled out as receiving primary emphasis in the reference material (* and **). Each of these 15 problems is described below and is based on information found in the digest which is accessible by the index.

Resource Outcome Problems

Intense use conflicts among competing uses. This was identified as a problem by most participants and was frequently accompanied by examples of resource use conflicts. The principal conflict noted was between estuarine preservation values and economic development demands. Another conflict frequently mentioned was between recreational activities (boating, fishing, swimming, etc.) and industrial, commercial and residential development (e.g., offshore mining, business expansion, and transportation services). Some participants noted that use conflicts are magnified by growing shoreland use pressures. Others observed that conflicts occur because everyone is pursuing their own interests irrespective of community or national interests.

Increasing population growth with residential, commercial and industrial development pressures. The participants noted the historical pattern and continuing trend of population increases in the coastal zone. This increase in population is accompanied by rising pressures for housing and business development, tourist and ocean-front facilities, port and harbor facilities, business support industries, and recreational opportunities. Many cited population growth as the underlying cause for most coastal resource problems, yet a problem which coastal zone management has a difficult time addressing by itself.

Extensive environmental pollution. 1968-72 were the formative years of environmental awareness and it should not be too surprising that this problem was the focus of much coastal zone discussion. While many spoke of pollution in general terms, three key sources of pollution were identified: (1) industrial and municipal sewage, combined with agricultural effluents (run-off); (2) oil spills from tankers, offshore production and natural seepage in harbors; and (3) thermal pollution from electrical generating facilities and industrial plants. Other problems mentioned were the contamination of freshwater supplies by salt water, and the inability of present techniques to cope with non-point sources of pollution. Some participants noted the cause of pollution as the failure of economic incentives to guide resources to their best use.

Destructive dredging, filling, and bulkheading. The prime reasons for these activities, in the case of dredging, are navigational improvements, stream diversion, other water projects, and shell, sand and gravel mining operations, and for filling and bulkheading, are residential

and commercial development. Numerous people identified dredging and filling as prime causes of both estuarine pollution (from dredge wastes and silt suspensions) and habitat destruction (from physical destruction and the reduction of bottom area).

Destruction of coastal habitat and degradation of fish and wildlife resources. This problem received particularly urgent attention because the destruction of coastal wetlands by dredging and filling was realized to have irreversible consequences. Participants cited studies showing the number of acres of wetlands destroyed and the resulting loss of important living resources, which provide food, economic, and aesthetic benefits. The problem was attributed to five primary causes: (1) water management and coastal engineering projects; (2) increasing residential and commercial development; (3) industrial and municipal wastes; (4) extensive dredging and filling; and (5) the mismanagement of biological resources.

Limited public access and recreational opportunities. Participants cited statistics which compared the total amount of shoreline acreage to the small amount accessible to the public. Four causes were identified: recreational opportunities are being destroyed by pollution and habitat destruction; local and state governments lack money to acquire recreation lands; private beach development is restricting public access; and recreational values do not receive adequate representation in the marketplace.

Organizational Process Problems

Lack of coordination among public agencies. Numerous people identified the problem of poor coordination among coastal management agencies. This problem seems to have resulted from the overlapping and fragmented management responsibilities of the large number of public agencies involved in coastal management and from jurisdictional conflicts between federal, state, and local agencies over management authority (e.g., outer continental shelf oil and gas development).

Insufficient planning and regulatory authority. A key problem cited was the lack of planning and regulatory authority at state and local levels. The geographical limitations of local jurisdictions, the lack of zoning powers or other legal devices, and the piecemeal nature of most programs were all identified as the reasons for the inability of state and local governments to properly manage coastal resources. State governments have apparently relinquished management authority to local governments which are more prone to manage the coastal zone according to their own short-term economic needs.

Lack of clearly stated goals. Many participants noted that federal and state governments lack clear goals and policies concerning the use of coastal resources. For example, resource managers lack clear guidance in managing competing coastal uses such as oil development and fishing. In addition the conflicting missions and policies of federal resource agencies are compounding the problems of coastal management for state and local governments.

Insufficient data base and lack of information for decision-making. A frequently cited problem was the lack of necessary information for

managing the coastal zone. For example, good baseline data concerning the amount of submerged lands and coastal marshlands in public and private ownership, the extent and value of fish and shellfish resources, and the environmental condition of the shorelands and coastal waters do not exist. Participants also noted a lack of government monitoring capability and poor communication between researcher and decision-maker.

Little understanding or knowledge about coastal ecosystems. University, government, and private researchers emphasized how little is known or understood about our coastal ecosystems. Some specific types of information were identified as needed and included the following: an understanding of the assimilative capabilities of coastal waters, an ability to predict the movements and physical effects of waves, and a knowledge of how waste effluents impact biological organisms. Many researchers pointed out that little money is available for doing coastal ecosystem research.

Primitive analytical tools and predictive methodologies. A problem hindering coastal management, noted by numerous people, was the primitive analytical tools and predictive methodologies available to managers. Three deficient areas were mentioned: (1) the lack of land use and hydraulic modeling capability, (2) static rather than dynamic planning methodologies, and (3) an inability to evaluate the benefits and costs of non-market public goods (e.g., aesthetics, environmental quality) and compare them with traditional economic considerations.

State and local governments do not have the funds to adequately manage the coastal zone. Many people observed that state and local

governments do not have adequate funds in four areas: money to implement local coastal zone programs; support for coastal ecosystems research; money to hire management expertise at the local level and perform necessary planning and evaluations; and funds to acquire public lands for recreation and preservation.

Dominance of short-term management over long-range planning. An important problem noted was the lack of long-range planning being done in allocating coastal resources. Two causes of this problem were identified, the free-market tradition of allowing individual owners to use their land as they please and the desire for short-term profits on the part of developers, local governments, and public agencies.

Resource decisions are made primarily on the basis of economic considerations to the exclusion of ecological considerations. Many participants emphasized that resource decisions were being made on the basis of economic rather than ecological criteria. Aesthetic and environmental values were not being adequately represented in coastal resource decisions. Local government property taxes were identified as an important reason for this bias in favor of economic criteria. Local governments, which have control over much of the nation's coastal lands, have policies that tax property at its highest use which is a strong impetus for economic development.

Causes of Coastal Problems

While many different causes to problems were suggested by individuals and organizations in the digest, for the most part, only immediate causes were identified. For example, many cited extensive dredging and

filling as the "cause" of habitat destruction, but few discussed the causes of dredging and filling.

As could be observed from the descriptions, there was a close interrelationship between the resource outcome problems with one frequently being cited as a cause of another. These relationships are represented in Figure 1.

While organizational process problems were not as interrelated as the first group, certain process problems were identified as leading to, if not causing, other process problems. These relationships are represented in Figure 2.

Some participants made the initial step of linking resource outcome problems and organizational process problems by identifying the latter as causes of the first. For example, the lack of clearly stated goals (as to a determination of priority uses) was seen as a cause of intense use conflicts among competing uses. Other causal relationships are represented in Figure 3.

In an evaluation effort, understanding the causes of problems can be very useful in focussing remedial actions to alleviate the problems. A careful evaluation effort needs to trace the causal chain from the outcome problem back to the problems in the process from which the outcomes emerge. Process problems are the most amenable to remedial action, especially in coastal zone management programs where the development of processes for coastal management are stressed. Knowing only that a problem exists does not provide the basis for action to remedy the problem. Action can only be taken when one knows why a problem

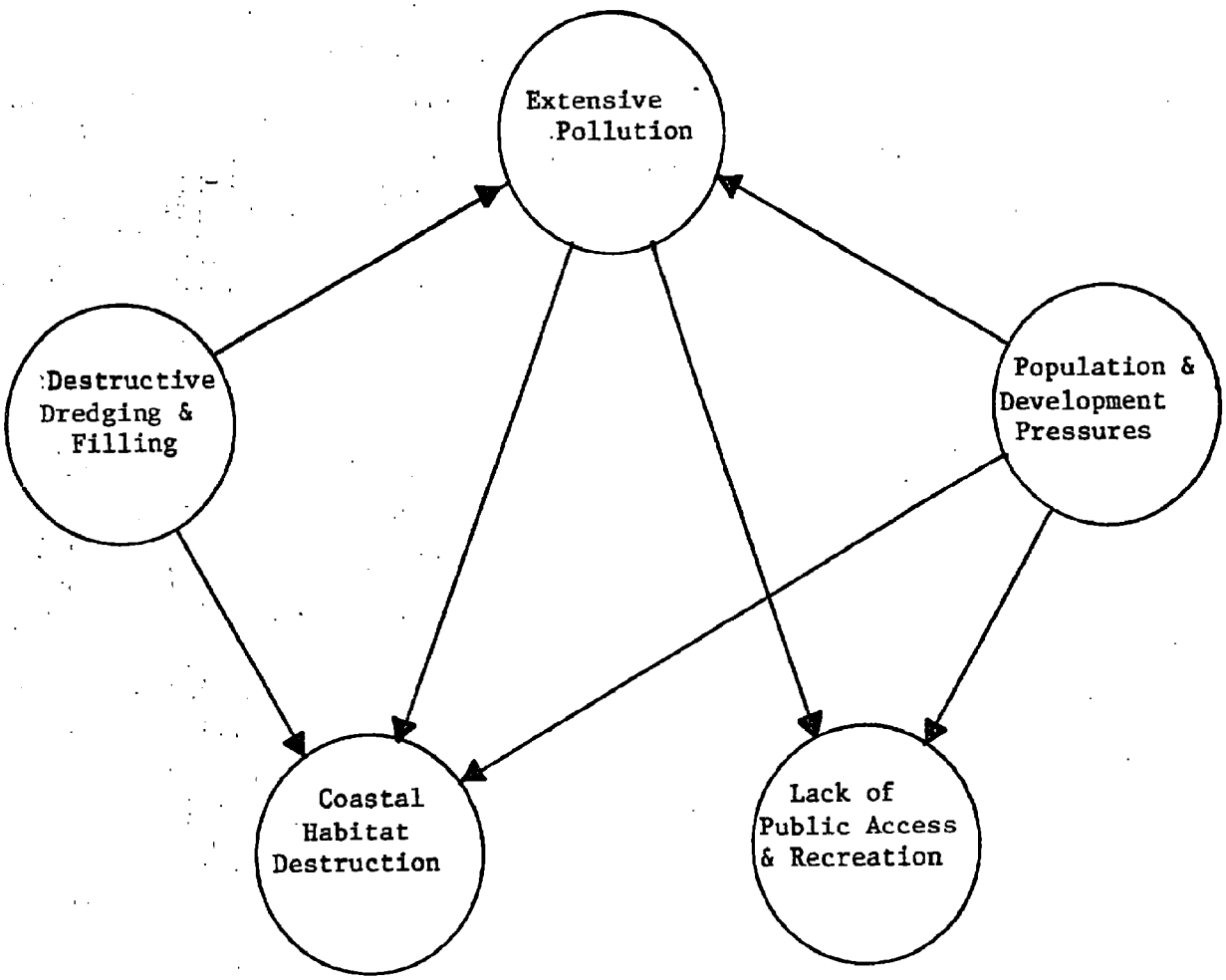

Figure 1. Resource outcome problems were often cited in the digest as causing other resource outcome problems.

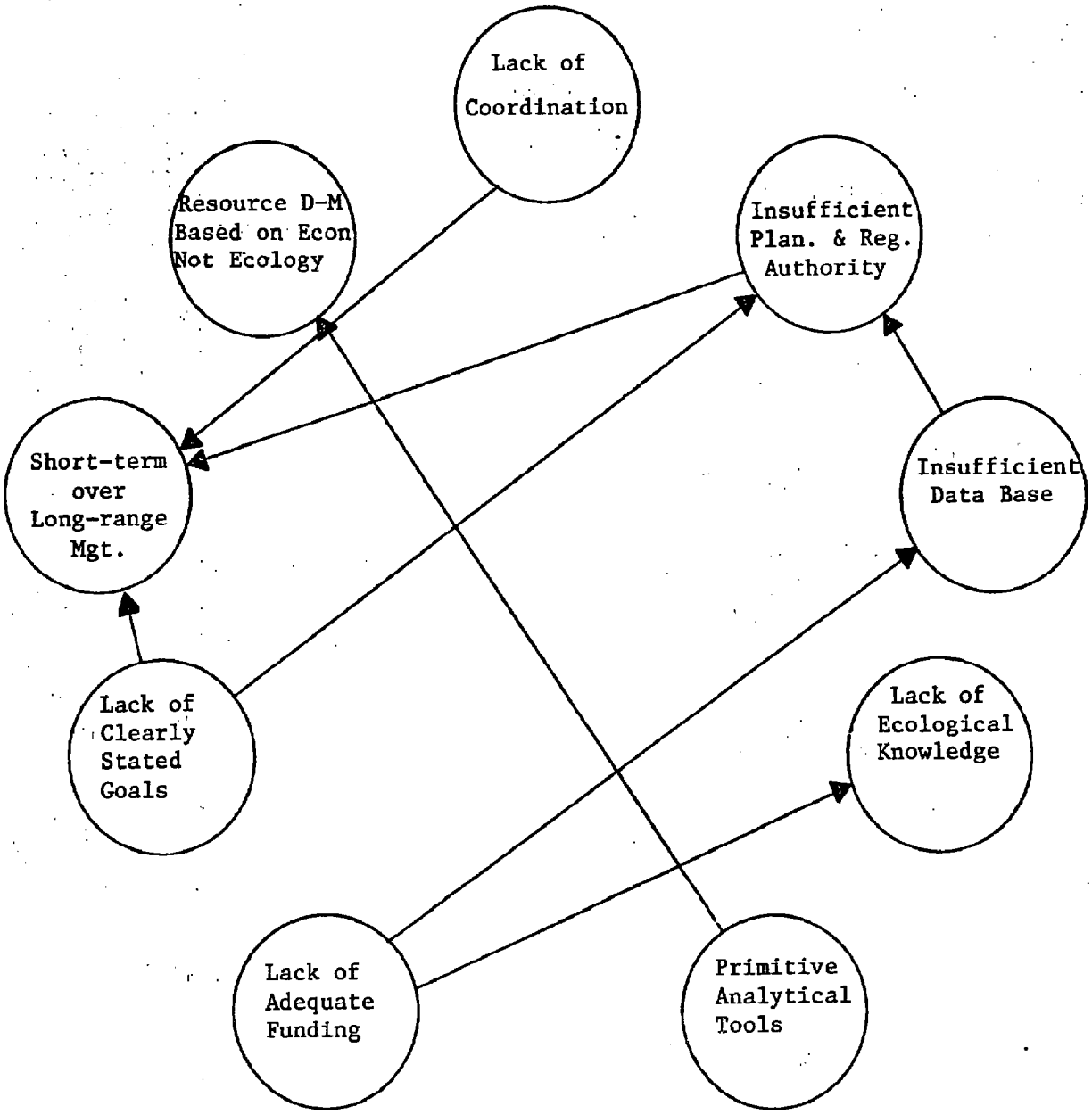

Figure 2. Certain organizational process problems were identified in the digest as leading to , if not causing, other process problems.

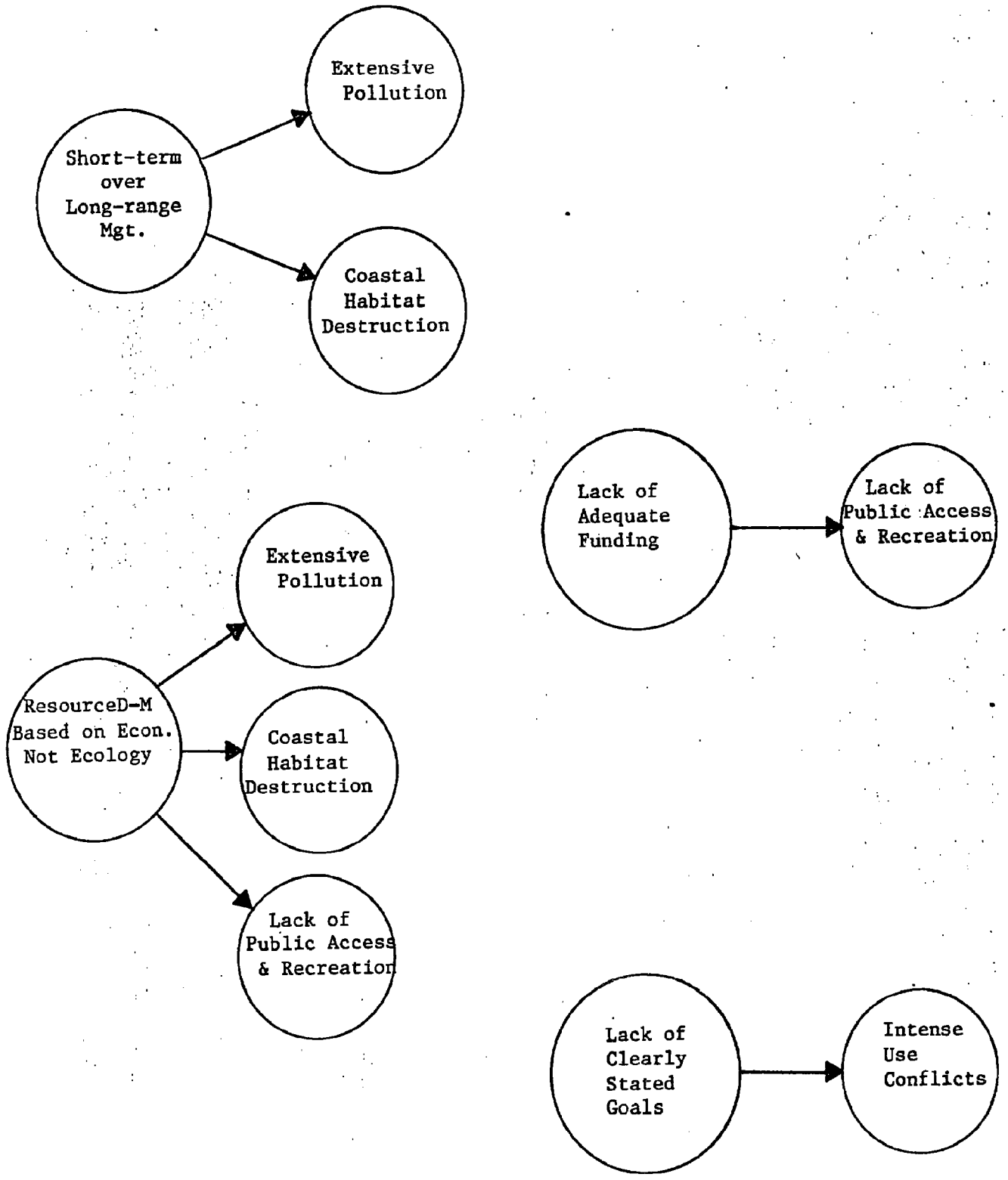

Figure 3. Some organizational process problems were noted in the digest as causing resource outcome problems.

exists. Understanding causes allows one to tell why as well as what is happening with respect to a particular problem. This understanding allows a more careful selection of the problems to be evaluated.

PROGRAM EVALUATION

Effective planning and management is dependent upon information about the past. Information is needed about past planning and management activity, about whether previous decisions were actually implemented, about changes in the environment that have affected the outcome of action, and about new scientific and technical discoveries that may affect future actions.* Program evaluation provides this kind of information in a systematic fashion. After an agency's policies and programs have been implemented and have become operational, they can be evaluated to determine achievement. Information from this evaluation can be used to strengthen weak programs, fully support effective programs, and reevaluate those which are not fulfilling their objectives. Evaluation is valuable to those affected by the program and to the public as a whole.**

There are two basic types of program evaluation, outcome evaluation and process evaluation. Outcome evaluation compares program goals with program accomplishments to determine effectiveness or success. For example, in coastal management, outcome evaluation judges progress made in achieving such goals as access to tidelands, improvement of water quality, and shoreline aesthetics. Process evaluation, on the other hand, examines an organization's decision-making procedures from which

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*Mary F. Arnold, "Evaluation: A Feedback Model," in Henrik L. Blum and Assoc, (ed.), Health Planning, University of California, Berkeley, 1969.

**The policy literature distinguishes between this method of evaluation, where a program already in operation is examined, from plan evaluation, where the consequences of a proposed program are identified. Examples of the latter method include the use of benefit-cost analysis and technology assessment techniques.

program policies and ultimately outcomes emerge. Process evaluation examines such items as public involvement, flows and quality of information, and planning and regulatory authority.

A number of difficulties may be encountered in performing program evaluation. First, causal relationships between resource outcomes and program actions may be difficult to establish. Often numerous programs and environmental influences affect the outcome being examined. Further, current social science theories are not developed enough to explain the process of social change and behavior. Second, it is often hard to obtain baseline data to compare past and present conditions. Appropriate evaluation data is frequently not gathered over the time period needed for evaluation research. Third, criteria for program evaluation may be difficult to clearly identify. For example, the goals of coastal zone management may be inadequately expressed in legislative policy. Fourth, evaluation criteria may not lend itself to measurability. This is particularly true for process evaluation, in that it is difficult to construct meaningful indicators for criteria such as information availability, and planning and regulatory authority. These program evaluation problems may vary depending upon the type of evaluation effort undertaken.

Formulating Criteria for Evaluation

Earlier it was stated that our research has focused on coastal zone problems and their causes as perceived during 1968-1972. We have chosen problem-alleviation as the basis for evaluation since statements about problems and their causes provide a richness of detail beyond that provided by legislative language and allows greater opportunity for

remedial action. Hence, the question to be considered in evaluation is whether a particular problem has been alleviated.

To answer that question, criteria must be developed by which program achievement can be measured. In the case of resource outcome problems, objective criteria could measure changes in environmental or resource use conditions over time. In the case of organizational process problems, criteria for evaluation are more descriptive and qualitative and involve close observation of an organization's operations.

Two examples of criteria for evaluating problems are presented--first, criteria for a resource outcome problem and second, criteria for an organizational process problem. The suggested criteria were derived from statements of the problems and subproblems recorded in the digest, plus a modest brainstorming effort by the investigators. A complete list of measurable criteria would require a separate study peculiar to the problem chosen for evaluation.

With respect to one of the key resource outcome problems noted in the digest, the destruction of coastal habitat and degradation of fish and wildlife resources, some illustrative measurable criteria include:

- acres or square miles of coastal habitat destroyed or enhanced per year by:
  - different kinds of coastline (developed-undeveloped, suburban-rural, etc.)
  - different kinds of uses (water-dependent, recreation, residential, etc.)
  - different jurisdictional areas (states, port authorities, etc.)
  - fish and wildlife species

- percentage of undeveloped wetlands developed per year
- estuarine-dependent fish caught by stock per year by area
- estuarine-dependent fish and wildlife kills per year from specific pollutants

A key organizational process problem noted in the digest concerned the problem of resource decision-making based principally on economic, rather than ecological considerations. Our review suggests the following criteria to measure the influence of economic considerations on decision-making:

- public finance considerations (local tax structure and budgeting needs) in decision-making
- prevalence of growth values among decision-makers
- commercial and industrial pressure groups' influence on decisions
- employment needs influencing decisions
- public service needs (roads, sewers, etc.) influencing decisions

Linking Outcome and Process Evaluation

Although outcome and process evaluation measure different consequences, both have their own utility. Outcome evaluation provides important information on how resource use is changing over time which is of particular interest to resource user groups and the public at large. Process evaluation, in contrast, provides useful information about organizational capability and is of particular interest to program personnel and policy researchers. Even though outcome and process evaluation can be performed separately, it is particularly advantageous to perform them together.

An earlier discussion noted the importance of tracing the causes of resource outcome problems back through the causal chain until organizational process problems can be identified and remedied. This can be illustrated using the two problems highlighted above. A six-step procedure to trace the causes of a problem is summarized as follows:

Step 1 - Analyze resource outcome problem.

Step 2 - Identify resource outcome causal problems.

Step 3 - Identify key public agencies authorizing resource outcome problems to occur.

Step 4 - For each public agency, note important organizational process problems contributing to resource outcome problem.

Step 5 - Analyze organizational problems.

Step 6 - Develop strategy for alleviating key organizational process problems.

Step 1 in the procedure analyzes whether the resource outcome problem of coastal habitat and fish and wildlife resource destruction has been alleviated. Here one measures what is happening to the environment and resource use using criteria such as those illustrated above.

Step 2 is the first step down the causal chain. A variety of factors might be noted which are causing habitat and fish and wildlife destruction, such as landfills for residential development or water pollution from industrial effluents.

Step 3 traces the causal factors back to the key public agencies which authorized the residential development or water pollution to take place.

Step 4 focuses on the most important of the public agencies involved and applies to each, in checklist fashion, the potential organizational

process problems involved in their decisions to allow the residential development or the water pollution. The list of organizational process problems developed from the digest presented above could be a useful starting point for that analysis.

Step 5 involves the application of criteria for analysis under any one of the organizational process problems. If, for example, the process problem of resource decision-making based primarily on economic rather than ecological considerations is deemed a key organizational process problem, criteria to evaluate that problem, such as those listed above, could be used. If any one, or combination, of those criteria reveal an important factor in causing the problem, the target for remedial action has been identified.

Step 6 develops strategies for alleviating the target process problems.

This step-by-step sequence illustrates the thought pattern followed in tracing the causes of resource outcome problems. Each step adds many new potential causes, and would resemble a tree (a mighty oak as opposed to a slender alder) if all potential causes were listed. The steps noted above take one small branch of the tree and illustrate the points at which the information derived from the digest might be useful in evaluating a few of the causal problems. It should be noted that one could reverse the procedure and begin instead with organizational processes to trace their impacts on resource use. For example, one might examine how the availability of certain kinds of information has affected the use of coastal resources.

Past Evaluation Efforts in Coastal Management

A review of the coastal management literature reveals that little work has been done in the area of program evaluation. This may be due to the recent origins of federal and state coastal management programs. Those evaluation efforts which have been completed have focused on the California and Washington state coastal programs, two states which have been active in coastal management for several years. Below is a synopsis of the seven most pertinent coastal evaluation efforts:

"Coastal Zone Management from an Administration Perspective: A Case Study of the San Francisco Bay Conservation and Development Commission," Gerald C. Swanson, Coastal Zone Management Journal, 1975, Vol. 2, Number 2, pp. 81-102.

The effectiveness of the Bay Conservation and Development Commission (BCDC) is evaluated with respect to three resource use goals: (1) prevention of land fills, (2) increasing public access, and (3) improving shoreline quality. After determining that the BCDC achieved these goals the article explains why the BCDC was successful in terms of (1) its historical development, (2) organizational structure and (3) decision-making processes.

"The San Francisco Bay Plan: Combining Policy with Police Power." E. Jack Schoop and John E. Hirten, AIP Journal, 1971, Vol. 37, Number 1, pp. 2-10.

This article concludes that the BCDC has proven to be a capable and politically effective organization because it (1) shrewdly mobilized extensive public support for its actions, (2) made use of its clear and specific regulatory authority to control filling and dredging, (3) prepared a comprehensive coastal plan with considerable public participation and involved important decision makers including parties opposed to the creation of the Commission, (4) used multidisciplinary expertise to prepare the plan, and (5) effectively coordinated the management of studies done by consultants.

"Saving California's Coast: The Coastal Zone Initiative and its Aftermath," Robert G. Healy, Coastal Zone Management Journal, 1974, Vol. 1, Number 4, pp. 365-394.

The coastal permit and planning processes mandated by the 1972 California Coastal Act are examined in this article. The author evaluates the impact of the first 13 months of the Act's implementation on beach access and acquisition, density and growth, environmental protection, energy facilities development, aesthetics and agriculture.

"Information Utilization and Self-Evaluating Capacities for Coastal Zone Management Agencies," Mark S. Rosentraub and Robert Warren, Coastal Zone Management Journal, Vol. 2, Number 3, 1976, pp. 193-222.

This article records the 1973-1974 coastal permit decisions made by the Southern California Coastal Commission by location, size, land conversion, construction costs, and decision and information management procedures. The authors advocate building into coastal agencies a self-evaluative capacity which would enable them to monitor and judge their activities.

"State Review of Local Land Use Decisions: The California Coastal Commissions," Paul Sabatier, 1976, to be published in Coastal Zone Management Journal.

After reviewing the permit procedures and policy directives of the 1972 California Coastal Act, this paper analyzes a random sample of regional decisions which were appealed to the State Coastal Commission from February 1973 - June 1975 in terms of (1) the types of development involved, (2) the major issues discussed in the staff reports and at the state hearings, and (3) the decision reached by the Regional and State Commissions on different types of development.

"Local-Regional Interaction in the Development of Coastal Land Use Policies: A Case Study of a Metropolitan Area," Robert Warren; Louis F. Weschler and Mark S. Rosentraub, 1976, to be published in Coastal Zone Management Journal.

The development trends prior to 1973 in eleven local jurisdictions along the Los Angeles county coast are compared with the decisions of the South Coast Regional Commission after 1973. It

shows that development trends have not been significantly altered by passage of the 1972 California Coastal Law.

"Interim Assessment of Washington State Shoreline Management," Maureen McCrea and James H. Feldmann, 1976, to be published in Coastal Zone Management Journal.

Washington State's first three years of experience (1971-1974) with the Shoreline Management Act are examined and evaluated in this article. The study focuses on the permit management system mandated by the SMA and describes how shoreline permits are issued and appealed, examines problems encountered in translating legislative policy into administrative action and assesses the effect of the Shoreline Management Act on the allocation of coastal resources. Criteria for the assessment are derived from the policy of the Act and include (1) minimizing environmental damage, (2) enhancing public access and recreation, and (3) encouraging water-dependent uses.

What is lacking in the literature are more thorough and extensive evaluation efforts linking resource outcomes with organizational processes, as well as an examination of the methodological problems of doing program evaluation in this field. Coastal management evaluations have not yet reached the sophistication of some of the major evaluation efforts in the social policy and education fields.*

Levels of Government at Which to Focus Program Evaluation

Most program evaluation in coastal management has been done at the state (e.g., McCrea and Feldmann), substate (e.g., Swanson-BCDC), or local government level (e.g., Warren). As indicated in the articles reviewed earlier, each level has its own unique array of resource and

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*For example, *see* Carol Weiss, editor, Evaluating Action Programs, Allyn and Bacon, Inc., Boston, 1972.

organizational problems, as well as its own political and social constituency to which an evaluation effort is addressed. This suggests that future evaluation efforts can be structured according to the level of government having distinct management responsibility, in order to clearly identify these problems and constituencies. This paper proposes the following four levels of program evaluation:

1. National Coastal Management Activities
2. Coastal Management Programs Under the 1972 CZMA
3. State and Regional Coastal Management Activities
4. Local Coastal Management Activities

Program evaluation for national coastal management activities would assess the state of coastal resources and coastal management organizations from a national perspective attempting to attribute the evaluation results to the many organizations, laws, and resource management programs involved. COE, HUD, FWS/NMFS, OCZM, state and local coastal programs, etc., and the resource use problems with which they are concerned, would be assessed inclusively to determine if coastal management has alleviated the problems of the coastal zone noted at a particular point in time. The constituency for this effort would include the Congress, federal administrators, the general public, etc.

An evaluation effort could also be conducted for the development and implementation of coastal management programs under the CZMA of 1972. The policy of the Act, its legislative history and implementing guidelines would constitute the standards against which evaluation would

be made. Organizational process criteria for evaluation would be the most pertinent since the Act stresses the development of governmental programs at the federal, state, and local levels. Evaluation of activities under the 1972 Act is possible at this time, but evaluation of activities under the 1976 Amendments to the Act would be premature. The constituency for such an evaluation would include congressional oversight committees, GAO, interest groups, etc.

Evaluation of state and regional coastal management activities and local coastal management activities have already begun, as reviewed above. Resource outcome or organizational problems peculiar to the state or region should be the source of criteria for evaluation. Data can be derived from permit records in the jurisdiction and surveys of resource use. The constituency for such an evaluation would include legislative and administrative bodies at the state and local level, interest groups, and the public.

Recommendations

It is believed that OCZM could sponsor or encourage evaluation activities at any of the levels mentioned. However, each level requires an explicit definition of what is to be evaluated and the criteria that is to be used. Since the task would be large regardless of the level chosen, an early decision to focus evaluation efforts at a particular level would be useful. The research in this report is directly applicable to the development of evaluation criteria at the national coastal management level. This material also would be useful for evaluating coastal management programs under the CZMA of 1972 if used to provide

amplification and detail to the general provisions of the CZMA, its legislative history, and implementing guidelines.

Based on our review of materials in the digest, we believe the most important group of problems for which criteria should be derived for a national coastal management evaluation effort are:

1. Extensive environmental pollution.
2. Intensive use conflicts among competing uses.
3. Destruction of coastal habitat and degradation of fish and wildlife resources.
4. Lack of coordination among public agencies.
5. Insufficient planning and regulatory authority.
6. Insufficient data base and lack of information for decision-making.
7. Little understanding or knowledge about coastal ecosystems.
8. Resource decisions are made primarily on the basis of economic considerations to the exclusion of ecological considerations.

While this is our top priority group of problems, they are not listed in any order. The description of the problems and their sub-problems in the digest is a first step in developing evaluation criteria for each problem. An example of deriving evaluation criteria was set forth above regarding the problems of the destruction of coastal habitat and the degradation of fish and wildlife resources.

Evaluation at the state, regional or local level would require a problem definition study similar to this one for the particular geographical area, and an analysis of the legislative/administrative objectives used to guide coastal management activities. Since these activities are

part of the development of coastal management programs under § 305 of the CZMA, a self-evaluation procedure could be initiated as a component of the implementation of coastal management programs under § 306 of the Act.

It is recommended that two steps be taken to broaden the perspective of the CZM-program evaluation question before specific decisions about developing an evaluation program are made. First, a review of program evaluation literature is necessary. This report reviewed only the literature dealing with CZM. Evaluation methodologies and efforts in fields related to CZM (water resources, land planning, environmental protection) as well as the large literature on social policy evaluation could assist the CZM evaluation effort a great deal. Second, evaluation of CZM activities is of interest to many individuals and organizations including state and local program officials, legislative and administrative offices, key user groups and others. A workshop to address the program evaluation question could be organized using this report and a literature review as preparatory papers for the workshop. The purpose of the workshop would be to recommend to OCZM the questions to be answered in a program evaluation effort and alternative approaches for incorporating program evaluation into ongoing OCZM and state program development activities.

Digest of Coastal Zone Problem-Statements

1968 - 1972

Prepared for the Office of Coastal Zone Management,
NOAA

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September 3, 1976

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[Adams quoted below from: Williamsburg Conf., 11-14-68]

Although State authority over coastal zone activities has certain advantages over Federal control, it, too, has some shortcomings:

1. In most State governments there is no single locus for guiding the rational development of the coastal zone....

2. Although State resource agencies, in general, recognize the need for reserving and preserving common coastal resources for future generations, they are handicapped in various ways: by shortage of funds for land acquisition...; insufficient background of knowledge to permit accurate predictions of the effects of alternative land uses; an impossibly complex, confusing, and conflicting estuarine land law; and often ineffectual legal control over land use.

3. And just as local governmental bodies are limited by the geographical extent of their jurisdiction, the States are likewise hampered. ...the States, too are frequently more prone to favor short-term economic return over the deferred benefits of a more conservative approach toward coastal zone management.... (pp. 130-131)

...local jurisdiction has several inherent weaknesses:

1. Local government relies in large part upon property and real estate taxes for its revenue....[this] prejudices decisions toward immediate development of all available space and against preservation of space as a common resource for future decision.

2. Local governments do not have available to them personnel trained in the fields of coastal engineering, hydrology, ecology, and outdoor recreation. In the absence of such expertise, they frequently are unaware of the consequences of their decisions upon their own local environment.

3. In many cases, the effects of local development decisions are felt over broad areas, far beyond local jurisdictions....local governments are reticent, and perhaps rightly so, to accept the cost of preserving an environment which stretches beyond their confines. (pp. 132-133)

At the present time, we really don't know the physical and biological composition of the coastal zone. A real determination can be made from charts or photographs, but we must know much more than this if we are to effectively manage this resource.... (p. 133)

Barrow, Thomas D., President and Director, Humble Oil and Refining Company, "State and Private Sector Relationships in Coastal Zone Management"

[Barrow quoted below from: CSO, 7-28/30-71]

...The important thing is to have some state government body capable of doing the job. At present the coastal zone is also the

"twilight zone" where government is concerned. In some cases there is no authority existing to set the ground rules; in other cases, the authority is too narrow and limited to do the job, or it overlaps with the jurisdictions of other federal, state, or local government bodies. The states can make a significant contribution if they will create a clear and authoritative channel for relations between government agencies at all levels and coastal zone users, property owners, and the public at large. (p. 122)

Beggs, James M., Undersecretary, Department of Transportation

[Beggs quoted below from: Hearings, House MM&F, 10-29-69]

It seems to me that the problem we are addressing ourselves to today in coastal zone management involves the basic problem of how you form an effective theme between the Federal, State and local jurisdictions. Most of our major cities are located within the zone, and, indeed, their areas are causing perhaps the greatest damage to the coastal zones. (p. 142)

Bissell, Harold, Program Manager, Comprehensive Ocean Area Plan, Calif. Dept. of Navigation & Ocean Development, "Coastal Zone Planning in California"

[Bissell quoted below from: Humboldt Sem., 5-7/8-71]

California has about 12-1300 miles of coastline... In this stretch we have this immense concentration of people...,90 percent of the population, very close to the shore, all demanding access to the water's edge, and all demanding a series of simultaneous uses of the same square foot in many cases. This leads to very emotional situations because some of these uses preclude access, others interfere with the esthetics, and many of them interfere with what might be called private property rights.... (p. 8)

...In doing something about the problems, one of the first things you have to do is decide what are the criteria for determining the importance of a given resource. You have to lay out some ways to go - to establish priorities among competing uses. This has turned out to be the most difficult job of all, because it is inevitable that whenever you get two people together on a subject you are going to get two opinions on the subject. (pp. 9-10)

Brown, Horace H., Director, Office of State Planning, Connecticut Department of Finance and Control, "Coastal Zone Planning in Connecticut"

[Brown quoted below from: N. Eng. Conf., 4-28/29-70]

Major problems confronting Connecticut in the area of coastal management are (1) preservation of the best of our remaining tidal wetlands; (2) elimination of water pollution as a serious problem in Long Island Sound and our estuaries; (3) preservation of the natural beauty and the quality of the shoreline environment; (4) regulation of dredging, and other extractive industrial operations in and under tidal waters; (5) provision for and management of adequate recreational uses of the coastal area; and (6) research, development, management, and regulation programs to improve the status and production in the area of marine fisheries. (p. 140)

Brownell, Arthur W., Commissioner of Natural Resources, State of Massachusetts

[Brownell quoted below from: Hearings, Sen. Comm., 4-9-70]

I think when we look at the coastal zone and see the multiple uses of the coastal zone, I think eventually there is going to have to be guidelines coming from the Federal Government relative to the use of the coastal zone. We have conflicting uses, particularly off of Massachusetts right now, with the exploration of companies for oil and gas, with the declining of our commercial fishing industry, and the commercial fishing industry is screaming at the oil companies doing the exploration for gas and oil. (pp. 913-914)

Cain, Dr. Stanley A., Assistant Secretary of the Interior for Fish and Wildlife and Parks

[Cain quoted below from: Hearings, House MM&F, 3-6-67]

At my request, the Fish and Wildlife Service has tabulated the 20-year record of loss of important fish and wildlife estuarine habitat along the Atlantic, Gulf and Pacific coasts and the Great Lakes shoreline... For the 26 states involved the total estuarine area is almost 27 million acres. The important area of basic fish and wildlife habitat is 8 million acres, of which about 570,000 acres, or over 7 percent, has been destroyed by dredging and filling....

For each State we have listed the three most important purposes of dredging and filling. Navigation heads the list, closely followed by commercial developments and housing developments. Additional purposes, coming within the major purposes for one State or another, include highway construction, oil exploration, mining, marinas, military bases, garbage dumps and beach erosion.... (pp. 30-31)

I have no measures or even estimates of recreational losses resulting from the physical destruction of estuaries, so I will assume that they approach the overall acreage loss.... (p. 32)

I would like to turn attention now to the manifest fact that most States and the Federal Government do not now have adequate legal devices to protect estuaries, especially from the loss of intangible or at least nonmonetary values of which many are of public interest. (p. 32)

Carruthers, W. Eric, Principal Planner, Santa Clara County, representing California Coastal Alliance, "Responsibility of Local Government"

[Carruthers quoted below from: Humboldt Sem., 5-7/8-71]

...In my County, too, we see things improving, but not fast enough. We have new Supervisors who are gifted men, and we have a new awareness among our public. Yet at the same time, forces for irresponsible development or blind progress still plague us, taking advantage of the limitations of fractionated city and county governments. While many developers are now carrying out some of the new development ideas that our department recommended ten years ago, there are still developers with the old view, the greedy view, who are trying to do the same kind of hackneyed development, the same kind of development that gouges the land and puts the penalty on the neighbor. In our hillsides, for example, there are still people who are trying to bootleg subdivisions and roads that dump trash, runoff drainage and erosion on the neighboring property. They operate with no concern for the public cost of their activities.... (p. 74)

Carter, Jimmy, Governor of Georgia

[Carter quoted below from: Hearings, House MM&F, 6-23-71]

We have in Georgia, which is a coastal plain region, a very fine fresh water aquifer which is under threat because there is an uncontrolled use of fresh water from the subterranean regions which has created, on several occasions, the incursion of salt water into the fresh water area.... In the past, in the coastal plains region we have had a flowing spring and wells. If you drilled a well there would be enough pressure to have the water spout from the surface, but this has been sadly depleted, and the water level is dropping because of unwarranted use of the fresh water supply. My only request is that in our overall planning there be included not just land above the water, but also the water beneath the land because this is closely related with the salt water from the sea. If we overdeplete the fresh water supply and the sea water does move under the land and contaminate the freshwater throughout the coastal area, it is serious.... (p. 144)

There will be a necessity in the future, a continuing necessity, to maintain the intercoastal waterways and to maintain the quality of the interstate highways and others being constructed now in the marshland areas. Georgia is doing all we can to minimize the impact of Interstate 95, specifically, which goes down the marshland area; but in the future the Corps of Engineers needs some direction as do the State agencies to identify legitimate spoil areas for continued maintenance of the intercoastal waterways. This will be a major problem for us and is one of the prime examples of a problem which this particular legislation can and ought to solve.

We also need to have some consideration given to the restoration of marshlands previously destroyed by causeways and other construction projects financed by the State or Federal Government when marshland waterways have been completely blocked out with culverts or bridge construction.... (p. 146)

Chapman, Dr. W. M., California Advisory Commission on Marine and Coastal Resources

[Chapman quoted below from: Hearings, House MM&F, 10-29-69]

First off, we don't get any money. The taxes go to the Federal Government, but we don't get very much back in handling our ocean responsibilities. The Bureau of the Budget has been notably reluctant to let any money out in this field. There has been a flat level for four years, no matter what the propaganda says, in ocean research, and we are not getting any better....

There is no program or laboratory in the United States that is not starved for money. As I say, we are laying up research vessels. Our programs are floundering. The young people we have educated are looking for other employment opportunities after we have trained them. (p. 138)

Chiles, Lawton M., U.S. Senator from Florida

[Chiles quoted below from: Hearings, Sen. Comm., 5-11-71]

...State funds, because of other pressing needs, are limited, and proposed plans for certain coastal areas have been forced to be delayed in lieu of priority areas. (p. 235)

The problems are many and varied. Private beach development restricts public access. Dredging and filling may downgrade commercial fishing. Offshore drilling rigs limit freedom of navigation and become pollution sources, and estuarine waste disposal depreciates all surrounding recreational uses. Until now, we have responded to this challenge on a first come, first served basis, but unless regional alternatives among competing uses are illuminated, we will continue to be helpless in responding to claims motivated by short-term advantages to individuals, industry and local government.... (p. 235)

The facts are all in that our coastal and estuarine zones are among the most productive natural areas found anywhere and are under constant pressure for development, transportation, urban growth, recreation - the full range of human activities. Development pressures for new residences and apartments, tourist facilities and industries, ocean front recreational facilities and other users of estuarine areas, all with their assorted service and utility demands, are mounting daily and focus attention on the importance of balancing development and conservation considerations in both planning and implementation.... (p. 236)

In Florida, S.582 would greatly facilitate the work already started, would supply a much needed dependability and increase of funding necessary to develop data and obtain research findings, establish sanctuaries essential to proper planning and permit intelligent and reasonable management of the coastal and estuarine zones of the State. (p. 236)

Clotworthy, John H., Chairman, Government Reorganization Committee, National Oceanography Association and President, Oceans General, Inc.

[Clotworthy quoted below from: Hearings, House MM&F, 10-29-69]

...One of the jobs, in fact, will be to straighten out the existing tangle of sometimes competing Federal activities. The clash between navigational needs and estuarine preservation is a classic example of competing interests. (p. 84)

Clotworthy, John H., Director, Office of Congressional and Legislative Affairs, NOAA, Washington, D.C., "Congressional Legislative Activities"

[Clotworthy quoted below from: N. Eng. Conf., 9/71]

...The Federal legislative activity, while terribly important as a "climate setting" device for state and regional action, is of no value if we fail to recognize the dimensions of the management task at the state level and the really spectacular demands to be placed on the scientific, business, and political institutions of the Nation.

This can be demonstrated best by focusing on a couple of fallacies that are presently lurking in our contemporary thinking about coastal and estuarine zone management.

The first is that once federal legislation is enacted and funds begin to flow to the state, that grand solutions to the management dilemma will materialize. Nothing could be further from the truth. The enormity of the research task alone is staggering... The physical, chemical, and biological processes of the local marine environment must be understood and at this juncture we are a long way from having that in hand, much less the ability to predict the effects of change through the non-uniform interactive natural systems. But even with the desired

level of understanding, we would have still to contend with the web of industrial, commercial and recreational use forces in the coastal zone which, in turn, react with a complex of economic, legal, and technical constraints. Research institutions are just beginning to look into means for modeling these socio-economic elements so that alternative plans can be evaluated through computer simulations. I do not believe that it is an overstatement to suggest that the research and development task before us in the intelligent use of the coastal zone is consistent with some of our most ambitions national R&D efforts in terms of the demand on our supply of money and talent.... (pp. 47-48)

Commission on Marine Science, Engineering, and Resources, "Report of the Panel on Management and Development of the Coastal Zone," Feb. 9, 1969

Many State and Federal agencies have overlapping and fragmented authority. The limit of State and local responsibility is often obscure; the authorities are often without real power. Under such circumstances it is particularly difficult for plans to be designed, made authoritative, and enforced. (p. 2)

Effective management and development of our coastal waters, lands, and resources require that man understand and predict the consequences of his actions. Although our understanding has increased markedly in the past 20 years, it is far from complete. The problems of the coastal zone are diverse and require the talents of economists, sociologists, engineers, ecologists, and community planners. Although the problems are similar from one part of the country to another, each estuary is different and requires study peculiar to its individual characteristics. Moreover, manpower must be trained to conduct and apply research in both management and development. (p. 3)

The coastal zone is the ultimate sink for many of our waste products. The capacity to receive these wastes is being exceeded. In many of the coastal zone areas pollution is the single most important problem. It is the one problem in which there is the greatest public awareness, and it is one problem about which there is the most action at all levels of government. It is evident that the people of this Nation are upset about pollution and they aim to do something about it. The problems of pollution, however, are more than marine problems. While manifestly acute in our estuaries, Great Lakes, and nearshore waters, the problem is a total National one wherein water, land, and air pollution should be treated together and at the sources which often lie far from the coastal zone. (p. 4)

Seventy-five percent of our population now lives in states bordering the ocean and the Great Lakes. This population is growing at a faster rate than the total U.S. population. There is developing a nearly continuous urban concentration along the Atlantic Ocean from Boston to Norfolk... (p. 10)

Our nearshore waters and coastlines are subjected to often conflicting activities and from them stem changes, legal entanglements, and institutional competition, the major contributors to the region's problems.... (p. 12)

Waterfront uses in urban areas have generally been incompatible with most commercial uses. Manufacturing and distribution industries and terminal facilities, primarily located in the urban waterfront areas of cities, have tended to deter commercial development [restaurants, hotels and motels, office buildings, etc.]. Significant exceptions are urban renewal projects to redevelop old and abandoned port facilities as in Baltimore and Philadelphia. (p. 13)

...Industry is expected to continue as a major competitor for use of a coastal environment. Problems associated with industrial development are:

- Pollution due to industrial wastes
- Space conflicts with other growing uses both on the nearshore and backshore accesses
- Loss of aesthetic attractions... (p. 13)

Increasing property taxes force most private land investors to dispose of their land as quickly as possible, which often involves subdividing or selling smaller portions. Local government units, anxious to increase the tax base, are not likely to preserve large and valuable shoreline parcels for an indeterminate future use. Suitable sites for heavy, water oriented industry, important to the balanced economic growth of a region, thus are rapidly becoming scarce. (pp. 13-14)

If remaining shoreline resources are to be adequately managed, it is important that additional information be obtained regarding the economic importance of waterfront location to various industries. (p. 15)

Housing is a major factor affecting coastal zone development. Both demographic and socioeconomic trends project a rapid increase of private waterfront development.

It seems probable that if current trends continue all wetlands will be filled and used for home building.

A survey in 1966 by the Fish and Wildlife Service indicated that commercial and private housing development (and related ventures) was the second principal cause in the loss of estuarine area...

Furthermore, sewage from waterfront homes often seeps directly into nearby waters, adding to pollution. (p. 15)

Outdoor recreational facilities are most urgently needed near metropolitan areas. As a result of continued urbanization, three quarters of the U.S. population will live in these areas by the turn of the century, and they will have the greatest requirement for outdoor recreation.

...At present about 6-1/2 percent of the total recreational shoreline is in public ownership. To meet demands it is considered essential that about 15 percent be available for public use.... (p. 16)

The technical relationships between recreation and other uses are complex. Partially treated domestic sewage may render water unfit for swimming or drinking but may act as a fertilizer for fish production. Some recreational uses are incompatible with others, e.g., water skiing and fishing.... Rarely will the answer be all or none; more likely it will be a rational balance of values. On the other hand, certain rare environments, like the Indiana dunes, must be preserved intact or lost completely. (p. 16)

Safety is the greatest concern in recreational boating. The annual number of major boating accidents has increased 34 percent in the last five years. In 1967 over 4,000 accidents involving 1,312 deaths were reported by the Coast Guard. (p. 18)

Twenty-four states operate coastal waterfowl preserves with funds provided under the Pittman-Robertson Act. The more recent Dingell-Johnson Act is not being significantly utilized for the preservation of estuarine and marine areas primarily because matching funds are unavailable. Most state fish and game departments operate on license revenues. Licenses are not required for fishing in many coastal areas and this creates reluctance to spend license revenues on marine projects. (p. 20)

Many states have laws established either upon unsupported assumptions or to accommodate a particular interest group, often the sport fisherman, at the expense of the commercial fisherman....

Such provisions have the overall effect of depressing the commercial fishery resource to the detriment of the State, industry, and wise conservation....

A legal framework relating to the coastal waters should be established sufficiently uniform to accommodate the continuous natural system it seeks to regulate. The basic objective of State laws and regulations should be a healthy commercial and sport fishery consistent with multiple or shared use, economic efficiency, and maximum sustainable yield.

Next to economics and legal problems, the fishing industry is concerned over the encroachment of the petroleum industry on what heretofore have been exclusive fishing grounds. Recent activity off New England and in Lake Erie has caused particular worry. (p. 21-22)

Many problems faced by the petroleum industry are common to other users of coastal waters and their resolution is in the best interest of all. These include:

- Improved navigation. The oil industry believes there is a pressing need for improved navigation systems. Accuracies in the order of $\pm$ 50 feet up to 200 miles from shore are indicated.
- Environmental forecasts. Better understanding and predictions of wind, sea, storms and other environmental data is needed to effectively plan and utilize personnel and materials.

- Traffic control on congested waters. This is important for the safety of oil rigs as well as the vessels transiting or operating in congested areas....
- Jurisdictions. It is in the interest of all users of coastal spaces to determine Federal-State jurisdication, and resolve unclear or nonuniform regulatory procedures. (p. 24)

A more recent navigational problem has resulted from offshore oil installations, the outstanding example being the Gulf of Mexico. Here there are about 6000 oil or other platforms offshore, with about half in or near shipping lanes....

Installations may be outside shipping lanes and still cause interference with nativation. Off the Port of Galveston, a ship lost 37 hours anchored in fog because its radar could not differentiate between sea buoys leading into the port and nearby oil installations. (p. 25)

Based upon the material made available to us and the great interest we have noted, the following problems have been identified involving natural and artificial changes in our coastal environment.
- Pollution
- Shoreline erosion
- Shoreline damage from storms
- Loss of wildlife and nutrient areas
- Silting and shoaling
- Eutrophication
- Proliferation of pests and unwanted species....

Erosion of beaches and shorelines is a serious national problem. Shoreline erosion is due to both natural and man-made effects. Sand is a diminishing important natural resource and its conservation must be considered in long range planning. The Corps of Engineers reports that about 65 percent of the Nation's coastline is inadequately protected or endangered.

The principal factors in shoreline erosion are:
- Damage by storms
- Shoreline construction affecting beach processes
- Inland development that curtails normal beach sand nourishment. (p. 29)

Protection of the shoreline and its associated nearshore and offshore activities from storms is of vital importance to the development and use of the coastal environment. This protection includes:
- shoreline stabilization and beach protection
- protection of estuaries, harbors and ports against wave action
- improved forecasts of storms and waves. (p. 34)

Much debate arises out of lack of knowledge about the consequences of dredging. The areas needing clarification include:
- influence of dredging on fish and shellfish ecology
- value of bottom rehabilitation by means of dredging
- effect of dredging on salt water intrusion

- pollution control versus salinity control
- effect of dredging of inlets and their stabilization
- disposition of dredging spoil. (p. 36)

Among the more serious effects man is producing on the coastal environment is the loss of wildlife and nutrient areas, principally in the estuarine regions. The central causes are identified as pollution and the filling of marshlands. (p. 37)

Located at the mouths of rivers, estuaries are particularly vulnerable to the ill effects of pollution and sediment from the river basin and from the great coastal cities that have arisen from the early centers of ocean commerce. At the same time, land fills, dredging, draining of marshes, and dumping reduce their surface areas.... (p. 37)

Mosquito control projects have devastating side effects on fish and other aquatic life. Although DDT and other insecticide pollutants are the most dramatic killers, there are other damaging control activities.

Coastal engineering projects such as harbor channels, power plant and flood control diversions can affect the circulation, flushing and mixing dynamics of coastal or adjacent waters.

The Federal Water Pollution Control Administration identifies the major physical problems of the Great Lakes area as:

- over-enrichment of the lakes
- build-up of dissolved solids in the lakes
- bacterial contamination of the lakes and tributaries
- chemical contamination from industrial waste discharges
- oxygen depletion of the lakes and tributaries. (p. 42)

The most important contributors to eutrophication ranked in order are:

- municipal waste water
- sedimentation
- agricultural runoff. (p. 43)

The existence of or proliferation of unwanted species is a problem of many regions although the types and effects of the species vary considerably. These include:

- jellyfish: Atlantic coast, especially Chesapeake Bay
- aquatic weeds: New England, Long Island, Chesapeake Bay, South Atlantic and Gulf waterways
- sharks: many coastal areas
- alewives: Great Lakes. (p. 45)

Predictably, pollution and its effects are felt most strongly and do the most damage in our estuaries and Great Lakes. One reason is that populations tend to cluster in these zones. Another is that these areas are the most valuable portions of our marine environment and also the most vulnerable to pollution. The hydrological and geological characteristics of estuaries make these waters a sink for the non-degrading wastes flowing in the river basins. (p. 50)

Even as we write, pressures continue to mount, which increase the pollution problem. Some of these noted...include:

- Rapidly increasing population...
- Greater mining of sand and gravel and possibly phosphates from off-shore locations...
- Increased desalting of estuarine and coastal waters as technology improves, creating brine, heat and radioactive waste disposal problems...
- Increased housing and commercial sites in estuaries, causing filling-in of marshes and bays, runoff of urban debris, and soil erosion.
- Increased volumes of pollutants such as pesticides, lead oxide from automobile exhausts, and other industrial and agricultural wastes, most of which eventually end up in the Nation's coastal zones.
- Increased recreational demands, resulting in more channel dredging for marinas, and small-boat harbors, shoreline modification for beach stabilization, and pollutants from recreational vessels.
- Increased dredging for larger and deeper ports and harbors, with accompanying loads of spoil...
- More and bigger nuclear-fired electric power plants located on the shorelines in order to obtain large quantities of cooling water...
- Oil pollution and pollution from other hazardous materials... (pp. 51-52)

The immediate need is to stem the heavy damage to the Nation's resources arising from the 2,000 or more spills of oil and other hazardous materials that occur each year in U.S. waterways. (p. 53)

In the face of the Nation's clean water goal, some Federal agencies have unclear or insufficient pollution control authority to carry out the Nation's desires. (p. 55)

There is a fundamental weakness in a procedure that attempts to persuade the Corps that factors other than navigational ones should be considered in its permit-granting activities but, at the same time, does not give the Corps the needed clear authority to act on these considerations. (p. 56)

Some Federal agencies seemingly have no authority to consider the effects of their activities upon water pollution. For example, the Atomic Energy Commission issues licenses for nuclear power plants whose waste heat could seriously pollute coastal zones. Yet this agency is not held accountable for such thermal pollution. (p. 56)

Many waste-treatment plants are not working at maximum efficiency because unskilled or untrained personnel operate them. Responsible governmental agencies should help train and require certification of operators of waste-treatment plants. If this action is to be fully effective, it should be coupled with adequate staffing and pay scales within the plants. (p. 59)

Beyond the increase in financial costs, spoiling in deep water also may entail an ecological price. Deep water disposal increases water turbidity and care must be taken to avoid damaging shellfish or other public wildlife. Finally, disposal of material taken from polluted

harbors or channels entails a presently undefined but potentially significant problem, both aesthetically and ecologically. (p. 70)

Under certain circumstances, further extensive deepening of harbors and channels entails danger to another major resource - fresh water supplies. These underground supply sources, called aquifers, may extend under harbors or channels. It is possible that harbor or channel deepening operations could damage the impervious layer of protective rock, permitting salt water to seep into the aquifers and thereby degrade or pollute municipal water supplies. (p. 71)

At present a lack of basic understanding is impeding our progress in several different areas, the most important of which are (1) waste treatment, (2) the effect of pollutants on living organisms, (3) estuarine dynamics, and (4) beach processes. (p. 75)

Industrial and municipal waste effluents originate at a point source making treatment of the wastes relatively simple. A larger problem is that such pollutants as agricultural chemicals (herbicides, pesticides, and fertilizers) or lead from gasoline engine exhaust do not originate at point sources. Agricultural wastes present both a research and a regulatory problem. Research is needed in the development of rapidly degradable and more specific herbicides and pesticides and on the development of fertilizing techniques that will prevent excess runoff. (p. 75)

Critical gaps exist in our knowledge of the life history of even the most well known inshore species. In particular, details of the early life are lacking, and it is during this period that animals appear most susceptible to environmental insults. (p. 76)

The relations between wind, waves, tides, sea level and beach stability (or instability) are very complicated. The relations are fairly well understood on a qualitative basis but are insufficiently identified on a quantitative basis. The design of effective and economical engineering works to restore, stabilize and protect our shores and beaches requires a quantitative understanding of shore processes. (pp. 78-79)

Technological capabilities, coupled with the discovery of rich mineral resources in some tidelands and submerged areas of the coastal United States, have heightened the conflicts between the States and the Federal Government, and have led to extensive major litigation and enactment of the Submerged Lands Act by which title to the bed and natural resources of the territorial sea within their boundaries was granted by Congress to the States.

While the Submerged Lands Act clarified some matters, it left to the courts major boundary and ownership questions still to be resolved. (p. 108)

To the list of pending and prospective problems must be added the need for greater boundary stability and new procedures for making binding baseline determinations.

At present there are no general procedures by which the Federal Government can enter into agreements with the States on the location of offshore boundaries, except by concurrent legislation or consent decree. (p. 120)

DeVall, Dr. Bill, Sierra Club, "Developing a Land Use Ethic"

[DeVall quoted below from: Humboldt Sem., 5-7/8-71]

...We recognize that the increasing pressures for development along the coastline have come about because of increasing population in California, the relative affluence of that population and the social desirability of ocean front property for home sites, recreation and industrial development.

White Americans [as opposed to the traditions of American Indians], both native to California and those moving here from other states, find it attractive to live within view of the ocean. Industrial concerns want deep water ports or the use of ocean water in their processing and vacationists want to use the coastline and adjacent uplands for a variety of recreational pursuits which are not always compatible with each other or with the ecological integrity of the coastline. (p. 85)

We frequently hear the argument in planning for the coastline the "highest use" principle should be used--that is, the project having the potential for greatest economic return to the investor and raising the local tax base, should take precedence over any other use. But who will benefit most from the development? Who will bear the hidden costs of development?... (p. 85)

Besides being poor bargains for the local communities, many developments along the California coastline have been opposed by the Sierra Club because adequate public access to the beaches were not provided and because the developments were class-based and inherently racist.... We deplore...that the California coastline has rapidly become the playground of wealthy whites and the plaything of gigantic corporations like PG&E which build huge capital intensive developments along the coastline (like oil refineries and nuclear power plants) which have very low labor requirements.

The great mass of California citizens are blocked from the coastline for three reasons--they cannot afford to live there; there are few jobs (except service jobs to the wealthy who use the coastline) and they cannot use large areas of public beaches along the coast because they are blocked from access.... (pp. 85-86)

[We have watched] the rapid destruction of areas of the coastline and the single-purpose planning of local vested interests.... We have seen local government hemmed in by precedent. We see local governments which do not feel responsible for natural heritage belonging to people of the State and nation. We see 200 agencies managing the coast, all operating for their single purpose with no coordination of effort, with

nobody answering directly for the "public interest" in the coastline, such concerns as public access, visual amenities, local governments thumbing their noses at the public, sometimes in violation of the letter and spirit of existing law. (p. 87)

Douglas, Philip A., Executive Secretary of the Sport Fishing Institute

[Douglas quoted below from: Hearings, House MM&F, 3-8-67]

About 65 percent of our Nation's commercial fish and shellfish and most marine sport fish species inhabit the estuarine environment during all or part of their life cycles.... The chronic often acute degradation of estuaries, resulting from man's continual alteration of the physical terrain and utilization of our rivers and streams for waste disposal, has already caused significant losses of these valuable natural resources. Man's inventive genius has severely challenged the ingenuity of sanitary engineers, not yet sufficiently successful to rid manufacturing effluents of highly toxic chemicals and heavy metal wastes. In many cases, much of these wastes remain hazardous upon reaching the sensitive estuarine areas....

Much untreated sewage, in the process of decomposition, utilizes the water's supply of dissolved oxygen that would otherwise sustain aquatic animals. In addition, dredging and filling activities by industrial, commercial, and residential developers interested in relatively short-term profits, have caused much havoc both by direct reduction of productive bottom area and by the destructive effects on aquatic life of resulting silt suspensions. (pp. 214-215)

Doyle, Robert G., Director of the Office of Science, Technology and Mineral Resources, Maine Department of Economic Development

[Doyle quoted below from: Hearings, House MM&F, 10-29-69]

The common development of recreation areas on the one hand and large-scale industrial activity on the other frequently cause conflict and agitation along the coastal zone....

The citizens of Maine cannot continue to accept the role as the "Rest and Rehabilitation Area" for the rest of the East Coast. We must broaden our economic base through major industrial developments; in particular, those along the coast. (p. 156)

Duddleson, William J., Director of Policy Studies, The Conservation Foundation

[Duddleson quoted below from: Hearings, House MM&F, 10-29-69]

I see most of these as essentially conservation problems. We have already heard a number of descriptions here of the most critical problems. They include pollution, shoreline alteration, especially dredging and filling; the conflicting pressures for land use, for residential use, for parks, ports, and powerplants. Are not these kinds of problems, and their solutions, tied more directly to the land than to the sea?...

In fact, land use conflict and our presently wasteful and inefficient ways of resolving it, and shoreline alterations, particularly dredging and the consequent destruction of estuaries and other valuable natural resources, probably are the most critical coastal zone problems. These come by land and not by sea. (pp. 87-88)

Ela, Johnathan, Assistant to the Conservation Director of the Sierra Club

[Ela quoted below from: Hearings, Sen. Comm., 5-11-71]

[S.582] is based on a premise - or at least it appears to us to be - that the critical limiting factor up to this point in the coastal protection legislation has been the availability of State funds. It certainly is true that State and local governments have difficulty raising money these days, but I do not think it is actually the case that a lack of money has been limiting this program.

I think, instead, that those States that have been negligent in coastal zone management have been so because of a lack of policy commitment rather than a shortage of funds. Virtually any State could raise planning funds implied in this bill through just, for example, a very minor transfer of funds from its highway construction and maintenance program. If these States had any true appreciation of the magnitude of the coastal problem, I think they would do that. (pp. 266-267)

Fasi, Frank F., Mayor, City & County of Honolulu, letter to Sen. Hollings

[Fasi quoted below from: Hearings, Sen. Comm., 5-4-70]

I strongly endorse the Congressional policy proposed in S.2802 and S.3460. The need for such policies and coastal zone management programs to preserve, protect, develop, and to restore the resources of our coastal zone here on the Island of Oahu, City and County of Honolulu, can be adequately justified very easily. Some of the many pertinent factors in this regard are as follows:

1. While the island of Oahu comprises less than one-tenth of the land area of the State of Hawaii, it contains approximately 85 percent of the total State population. Urban expansion is also affected by the fact that 50 percent of the State's prime agricultural lands are located on Oahu.

2. Unfortunately, in spite of efforts to date, some of our finest recreational and residential areas are becoming polluted....

3. Urban lands along our coastal areas have been subjected to tsunamis and high waves, causing extensive and costly damage. Coastal management programs are needed to minimize such disasters.

4. My Administration has in the past two years budgeted approximately 7 percent to 8-1/2 percent of its total $40 million Capital Improvement Program for acquisition of beach front lands for public purposes. This is inadequate to protect and preserve our coastal lands, but it is all we can afford in light of our other pressing urban demands. (pp. 1206-1207)

Foley, Eileen, Mayor, Portsmouth NH, "Cities in the Coastal Zone: Conflicts and Opportunities"

[Foley quoted below from: N. Eng. Conf., 4-28/29-70]

In New Hampshire, Portsmouth is unique among cities in more than one respect. We are concerned about that unique quality which stems from its seacoast location...however, when so many of the obvious benefits of coastal siting are denied to us, I think we must count our situation as an additional demand on the city coffers. (p. 112)

For instance: where the seacoast might offer us an immense recreational resource, the waters presently off Portsmouth are too polluted to make for pleasant swimming. In addition, most of the land abutting the water has long been commercially developed. We may not consider such development the most beneficial of shoreline land uses. In the early days of seacoast development, however, with inland transportation a far greater problem than coastal transportation, the founding fathers tended to squeeze everything close to the docks as possible.... Shipping, conversely, carries with it a twentieth-century problem: pollutants.... (pp. 112-113)

In Portsmouth we are large enough to be able to employ some of the experts required in order to join in such legal investigations [site evaluations]. In smaller towns, this kind of expertise is beyond the municipal budget. Who pays then? Where does the community acquire the technical knowledge necessary to cope with the technology of today? The answer is that no one pays, and the towns simply never get the help they need...or almost never. (p. 115)

Gazlay, A. Gene, Assistant Director of the Michigan Department of Natural Resources

[Gazlay quoted below from: Hearings, Sen. Comm., 4-16-70]

CRANE MILLER: I wonder if you could tell us in a little more detail some of the contents of this plan, the shoreline management and erosion control program that the State of Michigan has developed?

GAZLAY: Yes. I might say that it is in response to a request by Governor Milliken in his environmental message to our Legislature this past winter. Specifically, he is concerned primarily because of the fact that in 1969 high lake levels again caused severe erosion, particularly on Lake Michigan, and yet we find considerable residential construction underway without regard to these erosion risks. (p. 1040)

Gentry, George, Executive Secretary, North Coast Timber Association, "Industry and the Coastal Zone"

[Gentry quoted below from: Humboldt Sem., 5-7/8-71]

If you are going to zone property and this is what the majority of the people involved want, we would like to know exactly what you are zoning and exactly what we will be able to do when our crop is ready for harvest. We cannot afford to pay management costs on a crop for several years and not be able to get our profit at the end of the rotation period. I would like to point out one other feeling that I have, and that is if you zone something, or take something away from a private party, your argument may be that he will be compensated for the take.... But when you take successive amounts of property away from an industry and pay them for it, they take the money and invest in perhaps better investments than timber growing. But please tell me what happens to the man who lives on the north coast [of California] because he likes to live here, works in the woods as a logger because that is what he likes, and has invested in a home, car and property because he has been assured by us foresters that there will be a crop of timber for him to harvest forever. What happens when that is taken away? How is that man compensated for the fact that he no longer has a job or it appears as though his job has been limited because his people have been zoned out of the timber growing business? (pp. 65-66)

Georgia State Planning Bureau, "A State Program of Estuarine Management," December 1969

[Quoted below from: Hearings, Sen. Comm., 5-4-70]

Georgia's estuarine zone is a fragile, but highly viable resource. How long it will remain so depends upon the type of stewardship exercised by the citizens of Georgia. Presently no one is in a position to make the necessary policy decisions, no one is effectively attempting to

determine the proper mix of competitive uses, no one has the necessary responsibility and authority. Each element of the product mix is concerned with his own interest, and there is no unifying agent which brings all users together in common understanding of the resource as a whole. It seems most logical that some public agency should act as the unifying force to bring the diverse elements together in the common interest. Presently there is no unifying entity within the state government. A number of local and State agencies have responsibilities within the estuarine zone, but none is considering the estuarine zone in its entirety. Municipal and county agencies conduct land use of various sorts and enact zoning ordinances as a means of controlling land use, but most of these efforts are of a local nature, aimed more at what types of development should be permitted on a given area of land rather than whether development should be permitted at all.

Coastal areas must be inventoried and classified as to their best use, and those which must be preserved in the public interest identified as such. At present time the State doesn't really know how much of the shallow coastal waters, submerged lands, and coastal marshlands are in public or private ownership. A major factor which complicates the proper determination of ownership is that the term "navigable waters" has never been defined adequately in law. Thus, waters which appear navigable to the State may appear nonnavigable to some party in the private sector, and only a court can determine who is right. Furthermore, until the State determines which estuarine areas should be held inviolate, and which can be altered without excessively impairing the public resource, it runs a double risk of thwarting desirable development or permitting undue resource damage. In essence the State of Georgia needs to have an inventory by ownership, type of land, potential for development, natural resource value - of all the lands and waters of Georgia's vast estuarine zone. Finally if a comprehensive estuarine program is to be successful, some public entity must be given the responsibility and authority to carry it out. (pp. 1147-1148)

Goodenough, Richard D., Director, Division of Marine Services, New Jersey

[Goodenough quoted below from: Hearings, House MM&F, 6-23-71]

A decline in the area and productivity of wetlands has led to degradation of a wide number of fish and waterfowl species which are truly dependent upon these wetlands. Until recently, it has not been appreciated that wetlands are an integral part of both the terrestrial and the aquatic ecosystem, supporting an astounding array of biotic communities which thrive only when the unique nature of the wetlands habitat is maintained. Unrestricted activities such as dredging, draining, filling, dumping, and damming either totally destroy or permanently alter these wetland habitats and hence their productivity in the estuarine ecosystem. From a total of about 233,000 acres of coastal wetlands...about 50,000 acres, more than 20 percent, have been lost to filling, diking, dredging or otherwise altered in the past 17 years.

This alarming rate of flow has caused us much concern. There can be no question that the coastal zone must be protected at the National, State, and local levels, using every tool possible.... (p. 245)

...New Jersey is in need of additional Federal support so that it can implement its coastal zone program as rapidly as possible. This must be done before all of these irreplaceable natural resources fall to the dredge of the builder and to a wide variety of other potential uses competing for the privilege to profit for the benefit of the few at the expense of the many.... In the name of economic development, our State, up until a year ago, had been anxious to sell its interest in these precious lands, the proceeds going into the State school fund. The result of that policy is...[l]agoon developments here on the New Jersey Coast, approaching wall-to-wall urbanization in part. (p. 246)

Goodsell, Leonard J., Executive Director, Great Lakes Commission (previously 30 years in Corps of Engineers)

[Goodsell quoted below from: Hearings, House MM&F, 10-29-69]

We pointed out that there is a strong State position in the Great Lakes and the need for this panel to understand the Federal legislation, to consult with State personnel, and to become familiar with State efforts, statutes, regulations, and operating procedures; the futility of further layering of department, agencies, and councils in an attempt to solve our problems with the resulting further fragmentation of the U.S. water management effort; the desirability of fresh or innovative thinking on water management and planning, and more mundanely, the opportunites for water management progress with reasonable Federal funding support and a stabilized program or plan. (p. 92)

Gregg, R. Frank, Chairman, New England River Basins Commission

[Gregg quoted below from: Hearings, House MM&F, 10-28-69]

On the question of priority, everyone who has been involved in this national effort for the last three or four years to develop a system for effective management of coastal resources has recognized the unique values of estuaries and other natural systems in the coastal zone and everyone has also recognized and devoted explicit recognition to the conflicts and demands for use of the coast, but I don't see in the implementing proposals that are now before the conference any suggestions of the priorities that might be followed in attempting to reconcile these conflicts and I would suggest that public policy, and we are talking about what Government can do for management of the coastal zone, should accord to the protection and management of the natural systems themselves a priority over other uses.

There is no doubt that the degradation of the environmental quality of our coastal zone caused by an increased population is of major concern today. Historically an intense development has taken place at the interface between developed land and the ocean.... Consequently, coastal waters and estuaries have become the sink of most of man's liquid wastes as well as much of his solid wastes.... (p. 137)

Attempts, at various scales of operations, are now focused on how to resolve conflicts between public and private uses for many diverse interests and how to ultimately obtain the greatest long-term social and economic benefits. Private beach development restricts public access; dredging and filling downgrade commercial fishing; offshore drilling for oil limits navigation routes; and estuarine waste disposal reduces water recreation. Each of the uses of the coastal zone has its merits, but each is conflicting with other uses.... (p. 138)

In many cases, research is necessary to provide background data for answers to coastal management policy questions and to indicate options for management decisions in protecting and developing coastal lands and waters. In Florida, we have defined a large proportion of our research and information needs...a tremendous void of information remains and will remain for many years. Passage of H.R.2493, with its field laboratories, will reduce those number of years and the mistakes that man is making in the interim. (p. 138)

Growing public concern over the gradual degradation of our coastal environment has focused attention to the fact that the State funds simply are not adequate for insuring wise coastal development and preserving future options regarding natural resources in Florida's coastal zone.... (p. 138)

I guess the thing I would want to underscore in my prepared statement is that we think that the coastal zone management problem is probably most complicated in the State of Florida because of the tremendous pressure of people coming to Florida to retire and seeking the amenities of the coastal zone as a place for retirement.... Constantly, the battle between development on the one hand and preservation on the other hand, is a very weighty problem to have to designate those areas which should be set aside for nondevelopment as opposed to those areas which can be developed. (p. 138)

Gutermuth, C.R., Vice President, Wildlife Management Institute

[Gutermuth quoted below from: Hearings, House MM&F, 3-6-67]

The physical alteration of America's estuaries has been staggering. And the destruction goes on with little or no consideration given to the biological values that are being destroyed. There is virtually no effective local regulation. A State or two may be doing a good job, or at least the appropriate conservation agency, where there is one, has been provided with some authority to help protect estuaries and coastal

marshes having demonstrated wildlife and fisheries values. But speaking on the whole, the record is not good. Real estate and industrial interests have better connections with legislative bodies than do conservation interests. The readily accessible and easily estimated figures for new tax sources and jobs have a way of overwhelming the decisionmakers, the careers of many of whom depend on short term results. (pp. 104-105)

There is no question about the absolute necessity for reorienting our national approach to the use of estuaries and associated wetlands. On the east coast alone, for example, the Atlantic States Marine Fisheries Commission estimates that there was a physical loss of at least 70,000 acres of coastal marshes in the last 10 years. Additional thousands of acres have been made unproductive or have had their productivity greatly reduced by pollution, siltation, channeling, and by the dumping of garbage, trash, and industrial residues. (p. 105)

Haefele, Edwin T., Resources for the Future, Washington, D.C.

[Haefele quoted below from: Hearings, House MM&F, 10-28-69]

I was disturbed a little bit by the report of the commission and by much of the conversation that has taken place here today.

In dealing with this problem strictly as a "management" problem - recognizing that you are mostly management people, officials of State governments or of Federal executive agencies - I hope you realize that "management" tends to focus attention on the means rather than the goals. (p. 77)

Hargis, William J., Jr., Director, Virginia Institute of Marine Science

[Hargis quoted below from: Hearings, House MM&F, 10-29-69]

Since some division at lesser political and geographical levels must be suffered, the problem is to make the coastal zone management units local but not too local, to make them responsive to local needs but not powerless, or otherwise ineffective.... (p. 103)

Due to the complexities of the problems facing our "coastal zone institutes" or laboratories and to their legitimate impingement on the responsibilities of different Federal agencies, no Federal sources of support should be closed. Since additional money is necessary to speed settlement of the important and complex difficulties of the coastal zone, it is especially important that the Congress and the State legislative bodies lend strong monetary support to all the [Federal] agencies [previously] mentioned.... Additional moneys are needed. (p. 107)

[Hargis quoted below from: Hearings, Sen. Comm., 3-23-70]

...You have to be able to monitor - that is to follow through on the results of your planning and management. The latter is one area in which many State systems are lacking. We have management programs and we don't gather enough data to tell whether they are effective. (pp. 839-840)

SENATOR BAKER: ... would you tell me briefly what particular problems in your judgment require the most immediate research activity.

HARGIS: Briefly, I think that we have to be better able to relate productivity to the underlying physical and technical biological phenomena, productivity on which the economic interests are based.

BAKER: Productivity of what?

HARGIS: Productivity of the estuaries and coastal waters in terms of fish and other renewable resources. Another major problem at least to be addressed is to develop better capability to distinguish or detect pollution. Another problem that needs major attention is relating what we see in the way of discharge of effluents and the types of effluents to physiology of the organisms themselves.

Another problem is in terms of prediction of the movements of currents, and therefore, sedimentation and other factors. Another problem is to be able to develop mathematical modeling capabilities which, when integrated with the analog or hydraulic modeling capabilities, will permit better research, and, as important, better engineering in the coastal zone.... (p. 845)

BAKER: What do you see as the biggest problem or the biggest one or two problems in the field of coastal zone management in the next, say, 5 years?

HARGIS: The biggest problem is going to be, I think, in the realm of political engineering. That is out of my area, and that is going to be to develop a functional organization that will permit the local governments, State governments and the Federal Government working with the user to plan far enough ahead of time and take enough of the hard economic prospects into view, as well as - and this is a major difficulty - as well as recognizing the esthetic needs, maintaining the quality of the environment, and in fact determining what quality is necessary.... (p. 846)

...The major problem that we face, of course, is population growth and population location and industrialization which follows population. I think that until the general assembly or the Federal Government and some of the executive agencies face the problems of population location that we are fighting a rearguard action anyhow. (p. 848)

Hart, William J., Vice President, Coastal Zone Resources Corporation, Wilmington, North Carolina, "Techniques for Management of Coastal Zone Resources"

[Hart quoted below from: N. Eng. Conf., 9/71]

In spite of the overwhelming evidence that the total milieu is dynamic in each dimension, the preponderence of management planning is based on static concepts. Plans are made to specify the areas "needed" for industrial, commercial, residential, and open space uses at some future date. The planning documents still look as though the surface of the earth is two dimensional; there is little in the way of analysis of what changes in the bio-physical, socio-economic, and institutional environments will mean, or that there are likely to be differences of opinion about what is good for a particular place at a particular time....

Unless there is a sharp break with the static method of resource planning and a realization that public agencies ought to be utilizing a variety of mechanisms to influence the allocation of coastal resources now, any new categorical grant program designed primarily to plan for the use of coastal resources will probably follow the path of the Land and Water Conservation Fund: production of plans of all kinds to enable functional administrators to continue to do what they have always done in ways they have always done them.... (pp. 68-69)

I do not think there is a need to wait for Federal coastal zone legislation if a state wants to proceed now. It seems extraordinary to me that the coasts are only important to the nation or that only Federal agencies are able to think in comprehensive terms about our coasts. Probably one of the salient needs at the Federal level now is policy guidance to the Federal agencies about what the national interest is and what they ought to do about it.... (p. 76)

Hawaii Department of Planning and Economic Development, Hawaii and the Sea: A Plan for State Action, 1969

The marine environment is one of Hawaii's most valuable assets. It has shaped the major elements of the State's economy. Now it is being exploited even more directly by the rapidly growing tourist and recreational industry. Through such exploitation, and through population growth, the environment and its marine ecology are undergoing change at a rapidly increasing rate. The consequences of some of this change cannot be foreseen accurately; each decision which may improve, or degrade, the environment can have consequences which may accrue for several generations of man. The identical concern must be addressed to the exploration of marine resources, both living and nonliving.... (p. 23)

Nevertheless, the information thus far available about Hawaii's complex environment is fragmentary: It covers only certain aspects of local areas, and the surveys have usually been made on a once-only

basis. Not enough information is available at present to permit objective analysis of the consequences to our environment of various economic, social, and legal choices.... (p. 23)

The ocean and the shorefront do not remain static. Man has some control of the ocean and shoreline recreational assets. However, today he only exercises this control on a crisis basis. Today's assets are being damaged and tomorrow's assets may have been destroyed.

Beach erosion, especially of sand beaches, results from the forces of nature and from the actions of man. If areas being eroded are identified and there appears to be no central awareness of this at State level, corrective action or beach restoration may be possible.

Particularly damaging to sand beaches, and an action that can be curbed, is the practice of permitting construction to extend to the shoreline boundary of State property. This can have potentially unfavorable results to both the property owner and public lands. This is especially so on sandy beaches where the fluid condition of the high-water mark has been ignored and wave action can result in considerable loss of beach sand.... (p. 59)

There seems to be no central overall awareness of beach conditions. Undoubtedly this stems partially from divided control of the beach, both laterally and landward. Often contaminants such as seaweed, garbage, dangerous objects, and dead fish are allowed to remain on the beach until removed by wave or ocean action. More serious is the litter left behind by human occupancy, which can remain and accumulate over long periods of time, creating, at minimum, a hazard to the beach user.... (p. 60)

Conservationists and special interest groups have expressed concern over the deterioration and threatened deterioration of the coastal environment. There has been some activity by individual government agencies to exercise environmental control in the coastal zone. However, there have been no broad policy guidelines and there is no comprehensive program directed to the conservation and optimum utilization of Hawaii's coastal resources.... (p. 67)

Being insular, Hawaii is not affected by waste from other States. However, it is bounded by waters containing its own waste discharge. To date, waste management in Hawaii has been primarily land-oriented. The need to include coastal waters in waste management plans and programs has become urgent, however, because of the phenomenal shoreline development and the expanding requirements for recreation areas to serve a growing population - more affluent and with more leisure time - as well as a burgeoning visitor industry. The waste disposal requirements of shoreside industrial plants (e.g., oil refineries) are increasing and must also be considered. The reported deterioration of Kaneohe Bay serves as but one example of the imperative need to act.

It is evident that basic policy must be formulated for management of waste disposal affecting coastal waters. To what extent can wastes

be assimilated by coastal waters without detriment to the environment? The technology on the effects of waste discharge in tropical and semi-tropical waters is very limited. Most of the present research on the subject has been academic rather than of an applied nature.... (p. 67)

Structures on the shoreline and in coastal waters have a significant effect on the coastal environment. The shoreline structures can shift this balance and cause serious beach erosion problems, since beaches are usually in delicate balance between erosion and accretion. In addition, shoreline structures block access to the beaches.

Also, structures often cause or contribute to the pollution of coastal waters. For example, storm drains, sewer outfalls and oil lines all affect the coastal environment, since the effluent from these pipes seriously alters the undersea environment.

Surface structures lacking in aesthetic quality often blight the coastal landscape. It appears that lack of adequate planning and control has resulted in shoreline structures based primarily on economic rather than aesthetic considerations.... (p. 68)

Oil spillage from shore facilities, marine fueling stations and ships at sea is a threat to the coastal environment. Only limited planning has been done to protect the coastal zone and beaches either from everyday spillage or accidental spillage of greater magnitude.

The responsibility for dealing with oil spills in Hawaii is vague and fragmented among several agencies. There is no coordinated plan. Now that the Federal Government has established a national contingency plan to cope with the problem, it is essential that the State react with an integrated plan of its own. (p. 69)

Continuing population growth, accompanied by increased dependence upon the sea for food and recreation, will result in greater utilization of the reef areas by competing demands. New technological developments, such as atomic power reactors (temperature) and desalinization plants (brine wasted) can adversely affect the reef environment. Construction of drainage canals and flood control projects might also contribute to changes in the reef environment.

At the present time, we are far from understanding the short-range biological consequences of environmental modification. Each competing requirement for the utilization of Hawaii's reef resources will have to be evaluated as to its impact upon the marine ecology as weighed against compensating benefits to be derived.... (pp. 71-72)

The quality of the coastal environment can be detrimentally affected by surface runoff, which transports silt and debris to the beach areas. Although other pollutants such as sewage effluent have been singled out as a serious contributor to water pollution, sediment from surface runoff greatly exceeds the total volume of all other pollutants of coastal waters.

In addition to causing soil erosion and transporting soil particles to the receiving waters, surface runoff also transports other pollutants either in solution or attached to soil particles, waste products, or debris. Temporary fresh water dilution of sea waters in the vicinity of stream outlets can damage aquatic life. (p. 72)

Hickel, Walter J., Secretary of the Interior

[Hickel quoted below from: Hearings, House Pub. Wks, 12-3-69]

The coastal zone contains most of America's large metropolitan cities. And it is here that we see the urban crisis of overcrowding.... Obviously these large metropolitan centers demand - and attract - a vast array of industrial and service activities.... (p. 20)

The concentration of recreation in our coastal zone has, in most places, become so intense that the people who go there and the resources that take the pressure, are too often shortchanged. Likewise, the public has a legitimate interest in protecting the beauty of our landscape.... But too often these values - immeasurable in economic terms - receive inadequate consideration in the marketplace.... (p. 21)

The environment of the coastal zone is threatened by all the pressures I have mentioned in basically two forms: Pollution of its waters and the physical alteration - and destruction - of its lands by housing, industry, and transportation development.... Industrial and metropolitan sewage, agricultural pollution, and waste discharges are the basic causes of this pollution. Residential and industrial development, often aided by short-range zoning practices and the dredging and filling of the wetlands, create the most serious physical alteration of the coastal zone.... (p. 21)

In general, the character of land use especially in the metropolitan areas, is shaped by the tax structures of local governments which depend on the property tax for their revenue base. Considering the minimal revenues available to local governments in the face of their many needs, I can understand their problem.

Much of it results from the fact that the Federal Government has simply sapped the supply from incomes and forced the local governments to depend more heavily upon the development of land as its major source of revenue. This, in turn, has often penalized the wise use of land by encouraging local governments to zone just to increase revenues.... (p. 22)

Wise, multiple use of resources does not mean a halt or slowdown in industrial and economic growth. On the contrary...but the problem has been that uses not necessary in these areas, as well as necessary, but haphazard development have preempted important conservation and recreation needs. The present system has worked against sound conservation of resources, which - once lost - are gone forever. (p. 23)

Hodes, Dr. Richard, Florida Legislature and National Legislative Conference

[Hodes quoted below from: Hearings, Sen. Comm., 4-21-70]

If we are going to move into a county and tell them the estuary is now a preserve and they can't fulfill any of their aspirations for development, and "we are going to zone you out of business," we are going to need more than just the statutory power that the State itself creates. We need to have something to lean on to say that the Federal statute says we must do this, if we are going to carry out the coastal zone management plan; and the State alone, politically, will be in a very difficult position.

We must have federal support. So I cannot emphasize this point enough, that federal support of State legislation and State government in carrying out the zoning responsibilities is going to be particularly important. (p. 1092)

Hoogland, Richard J., Fishery Biologist, Texas Bureau of Commercial Fisheries Biological Laboratory, "The Coastal Interface"

[Hoogland quoted below from: Galveston Conf., 6-16/17-70]

Man's historic economic development has been closely linked to estuaries because of their strategic location, and, as a result, they are being extensively altered or destroyed. The Gulf Coast of Texas is experiencing exceptional economic growth. The problem is basically people. As more people occupy the coastal zone, the problems intensify. As our technology grows, the characteristics of the waters are being changed by domestic, agricultural, and industrial uses.... We readily admit that much is yet to be learned about the effects of pollution, but small pieces of evidence from individual scientific experiments tell us that the foreign substances added to the water can affect marine life in many ways without killing.... In the long run, these inconspicuous effects may be more disastrous than those which pile up masses of dead fish. (p. 78)

I would also like to point out our concern with many physical alterations taking place in estuaries. Specific activities which pose a threat to the coastal environment include bulkheading and filling; dredging of channels and fossil shell deposits; stream diversions; and restriction of tidal exchange and fresh-water runoff. Effects from a single one of these is usually small, but because they are so numerous, their compound effects are unquestionably producing major environmental changes.

Like the effects of pollution, some environmental alterations have obvious detrimental effects on marine life. It is not difficult to recognize the adverse effects of silt deposition on an oyster bed.... Nor is it difficult to recognize the adverse effects of spoil deposition or land fill that physically displaces habitat or acts as an isolation barrier and prevents utilization by marine organisms. Some of the

effects of engineering activities have much of the subtleness found in agricultural, industrial, and domestic pollution.... (pp. 78-79)

The incentive for anyone to try to alter these coastal areas, almost without exception, is the fast dollar. The fate of our total natural environment is under constant economic pressure.... The economic benefits of most dredging, filling, and polluting operations are recognizable and fairly easy to measure. But the economic losses are difficult to assess. We do not yet know how to determine and assign values to the intangibles of a quality environment such as natural beauty, recreation, fish, wildlife, etc. We remain at the mercy of development accounting which measures costs against benefits and excludes the cost of degrading the environment or the benefits of leaving the environment alone.... (p. 79)

Kirby, Robert, Acting Director of State Planning and Community Affairs, State of Virginia

[Kirby quoted below from: Hearings, Sen. Comm., 3-23-70]

The current status of planning in Virginia's coastal zone makes it apparent that a greater and more effective planning and management effort is needed. Presently, half of the counties in the coastal zone lack zoning ordinances and more than half lack comprehensive plans.... (p. 831)

The broad positive implications of the proposed legislation, in our view, are that it serves to emphasize the importance of the coastal zone, points up planning and related developmental problems, and provides funds for the States to deal with the zone's problems through the "coastal authority."... (p. 831)

Klashman, Lester M., Regional Director, Northeast Region, Federal Water Quality Administration, Boston MA, "A National View of Federal Planning for Coastal Zone Management"

[Klashman quoted below from: N. Eng. Conf., 4-28/29-70]

Planning and development in the estuarine zone has largely been done on an independent piecemeal basis. The resultant losses to fish and wildlife resources and the habitat upon which they depend; the negatory impact on recreational, scenic, and aesthetic qualities, and the decline in water quality all appear to be proceeding at an increasingly rapid rate. Whole sectors of the public object, but economic and political pressures, particularly at the local level, seem to win out and the irreparable damages to estuarine and coastal regions continue. (p. 17)

It is evident that a higher order of planning and evaluation is needed.... It must be kept in mind that the importance of the estuarine and coastal areas is not limited to the coastal states and communities.... Any recommended national policy must reflect the fact that there is a strong national interest in the effective management and protection of the estuarine and coastal zone for the following reasons:

1. The pressures of population growth and economic development, including requirements for industrial, commercial, and residential development; recreation; exploitation of mineral resources and fossil fuels; transportation and other navigation; waste disposal; and exploitation of fish and other living marine resources, impose an increasing number of conflicting demands upon the finite resources of the coastal zone.

2. Estuaries, marshlands, and other parts of the coastal zone contain an extremely valuable habitat for fish and wildlife that move beyond State boundaries; such areas are vital to the life support of a major part of the nation's commercial and sports fisheries harvest. Such areas, particularly the estuaries, constitute ecological systems which are susceptible to destruction and disruption by man.

3. Continued unplanned or uncoordinated development activities in the coastal zone pose an immediate threat of irreversible harm to the coastal zone and its resources and a loss of the benefits it offers. (pp. 17-18)

Knauss, Dr. John A., Provost for Marine Affairs, University of Rhode Island, and former chairman, Panel on Coastal Zone Management, Commission on Marine Science, Engineering and Resources

[Knauss quoted below from: Hearings, House MM&F, 10-28-69]

...I believe it is useful to emphasize one major premise underlying our recommendations.

The premise is as follows: The uses of the coastal zone are increasing. This trend will continue and probably accelerate. The increasing pressure on the coastal zone is causing an increasing variety of management problems. Some uses of the coastal zone are in conflict and some uses may be incompatible with one another. As we look to the future, one can see that these management problems will increase.... (p. 11)

...let me remind you of some of the coastal zone problems: Pressures on shoreline space have mounted dramatically over the past 20 years. The reasons are clear: the shift of the population from rural areas to the cities..., The spread of suburban development into coastal areas, and the increased affluence and leisure time of a large part of our population.

The revolution occurring in the shipping industry as we move to jumbo tankers, large bulk carriers and container vessels necessitates major changes in our ports and related transportation facilities.

...We need space for the large nuclear power plants of tomorrow and we must locate them in such a way as to minimize the consequences of the large amount of waste heat generated by these plants.

Recreation is one of this country's fastest growing industries and marine recreation is becoming more popular and varied....

Last but far from least, the coastal zone is used as a receptacle for pollutants... Pollution is more than a coastal zone problem, but I think our proposed coastal zone authorities will aid in this effort.... (pp. 11-12)

A major conclusion of our Commission was that the primary problem in the coastal zone was a management problem with all the attendant problems that proper management implies.... In reviewing the situation, we concluded that effective management to date has been thwarted by the variety of Government jurisdictions involved at all levels of Government, the low priority afforded marine matters by State governments, the diffusion of responsibility among State agencies and the failure of State agencies to develop and implement long range plans.

...Our second major conclusion was that the management task was primarily a State responsibility and that the Federal Government should encourage the States to accept this responsibility.... We also concluded that in most cases the States now lack adequate machinery for that task. We believe an agency of the State is needed with sufficient planning and regulatory authority to manage coastal areas effectively and to resolve problems of competing uses.... (pp. 12-13)

Knetsch, Jack L., Professor of Economics, and Director, Natural Resources Policy Center, George Washington University

[Knetsch quoted below from: Hearings, Sen. Comm., 5-4-70]

The problems we face in connection with maintaining and enhancing the values of the coastal zone and of the estuaries are not problems due to the lack of morality, nor are they really due to the lack of planning as is often implied. I would suggest that the problems stem primarily from a failure of our economic incentives to guide resources to their best uses, from the point of view of all of us. In important cases in the coastal zone, as in so many relating to pollution and other environmental quality problems, the pricing system provides a perverse incentive structure that most directly results in the real plight of environmental degradation we have before us.... (p. 1149)

It is often alleged that the basic problem of estuary and coastal resource degradation is that the resources are being destroyed by such things as pollution, dredging, and landfill operations. I would suggest that this is not the problem but only the immediate result. Rather, the problem is that individuals are making decisions concerning these estuary and coastal resources without being made adequately responsible and accountable for their actions.

The individuals impose important external costs on others by their actions. Destruction or alteration of estuarine resources often involves economic costs far above those the individual himself pays. These costs are not, therefore, being reflected in the prices by which those who alter the environment are guided in making their decisions. Owing to the pervasiveness of such external effects affecting important outputs of estuarine resources, the costs facing land developers and polluters do not reflect the true opportunity costs of altering the use of these resources.... (pp. 1149-1150)

An alternative approach for dealing with uneconomic degradation of estuary and coastal values might consist basically of a means to make the prices that guide resource decisions in these areas reflect the true costs that are incurred by reason of the resource destruction.... This proposal would impose severe strains on our current knowledge of the relative productivity of coastal resources. We do not possess sufficient information for an optimum solution, but I believe that the knowledge is sufficient to implement a scheme to make greatly improved allocations. Some judgments must be made in any event but making the value questions more explicit would aid in utilizing our current information in a meaningful way. It would also provide a focus and incentive to research efforts to improve these value determinations. (pp. 1151-1152)

Kruegar, Robert B., letter to Hon. Alton Lennon, 11-18-69

[Kruegar quoted below from: Hearings, House MM&F, 10-29-69]

It is quite likely that broadscale development of [Santa Catalina] Island and offshore areas under the jurisdiction of the State of California will be undertaken within the next few years which will directly affect the Federal offshore lands. In the same fashion, the use of Federal lands for mineral development or other uses will strongly affect the development of the lands lying within the jurisdiction of the State. The interrelationship between Federal and State lands in this area is illustrated by accompanying Resolution R-VI-1 of the California Advisory Commission on Marine and Coastal Resources regarding oil pollution and offshore drilling in the Santa Barbara Channel.

This problem at present may be peculiar to Southern California with due regard to the highly urbanized nature of its coastline and the press of interest for diverse offshore uses. It is quite likely, however, that the same type of boundary situation will be established in other areas, such as Alaska, Louisiana and the Atlantic Coast States, where titles have not now been stabilized to the extent that they have with respect to California, which could give rise to the same problem in these other areas. (pp. 195-196)

Lagow, Joe, County Commissioner, Chambers County, Texas, "Waterfowl Management and Harvesting"

[Lagow quoted below from: Galveston Conf., 6-16/17-70]

Picture in your own mind the thousands of acres of marshes and estuaries on the upper Texas Coast, teeming with its millions of waterfowl that migrated South each fall to spend the winter where lush food, water, and shelter prevailed for them, before man started alterations and destruction of this area....

Now, picture the same area as of today, with its thousands of people living in and around these marshes; blacktop roads leading in all directions from one area to another; one city to another; railroads running across the area; drainage ditches cut through the upper coast; ...large rice farms where marshes used to be, before drainage; large canals cut through the marshes...;large industrial plants operating and building more of them, oil fields developed in and around these areas, pipelines laid through the marsh... The waste and pollution from all the mentioned above, flowing into our lowlands, marshes, estuaries and bays. (p. 27)

Lamprey, Stewart, Federal Co-Chairman, New England Regional Commission, Boston MA, "Regional Considerations in Coastal Development"

[Lamprey quoted below from: N. Eng. Conf., 4-28/29-70]

...The coastal zone of New England represents perhaps the most crucial area in which the region's developmental and environmental conflicts must be resolved.... In New England, three major issues are emerging.

First, the issue of population density. Massive numbers of people utilize the coastline for homes, recreation, food, jobs and the necessary supporting facilities such as power plants and sewage treatment plants. New England has a very high concentration of population (166 persons per square mile); most of these people live along the shore.... Projections of population and employment to 1980 indicate a continuation of this trend.... In addition to the demands of permanent residents for housing, industry, and recreation space, burgeoning tourism and seasonal home industry creates its own set of pressures on land and the environment....

Second, we are running out of shoreline. A recent survey estimated about half of the nation's shoreline is amenable to recreation and human habitation. The survey found that only 5 percent of the total usable shore is now protected for use of the public. Virtually all of the remaining shore has been preempted for the private use of corporations or individuals.... (p. 151)

Third, there are conflicting uses.... We are becoming increasingly aware that man's utilization of land and the shallow waters of the

coastline can have devastating effects upon the fragile ecology of the air, land, and sea life.... (p. 152)

Although the causes of our present concern are many and complex, it is useful to identify two in particular: lack of coordination among conflicting demands, and lack of knowledge.

New England has a historic pattern of individual decision-makers taking isolated actions to further their individual ends, most of which were individually logical. As long as the coastline was viewed as an inexhaustible resource to be exploited, individuals and government agencies operated in isolation from any larger community concerns. Over the years, conservation and economic development interests viewed each other with attitudes ranging from suspicion to downright hostility. There were several reasons for such conflicts [including that c]itizen participation, which has frequently been limited to public hearings, has been called only after decisions had already been made.

A second cause of our problems is the lack of knowledge concerning many of the more subtle effects of man upon his environment; and even more distressing, how to correct the situation...science doesn't yet have the knowledge necessary to confidently predict the best ways to reclaim our threatened environment. (pp. 152-153)

League of Women Voters of the United States, "Where Rivers Meet the Sea," February 1970

[Quoted below from: Hearings, Sen. Comm., 4-14-70]

The problems of an estuarine area arise partly from what is done upstream in the watershed of the river's mainstem and tributaries and more directly from changes in uses of the water, shore and wetlands of the estuarine area itself.

Conflicts of interest among incompatible uses are common. Major conflicts arise over pollution, dredging, and conversion to dry land as pressures for urban and industrial development compete with concern for open space, recreation and ecological needs.

If population growth and movement toward metropolitan centers continue, vast supercities will spread for hundreds of miles along coasts and rivers by the year 2000. With accelerated industrial expansion, greater production and use of power, more shipping and larger vessels, plus increasing time for recreation, estuaries and their adjacent coastal areas will be called on to serve expanding urban areas in many ways.... (p. 957)

Putting into an estuary more inudustrial and municipal wastes than it can handle results in: hazards to human health through transmission of bacteria and viruses; loss of recreational and aesthetic appeal because of unattractive appearance and odors;...destruction of fish and

wildlife by highly toxic materials; [and] interference with migration, reproduction and growth of fish and wildlife... (p. 957)

Normal plant and animal life along shallow estuarine shorelines and bay bottoms is disturbed as dredging machinery digs or deepens channels; excavates marinas; shapes pleasure-boat slips and builds up adjacent sites for "Venetian style" waterfront homes; or mines sand, gravel, shell, clay or peat.... (pp. 957-958)

While cities have received much planning study, estuaries have been virtually ignored. Shoreline use has been left to owners and has been determined by demand and price, with little regard for environmental values. However, if estuary alteration is to be controlled, use of estuarine areas must be carefully planned. To have orderly development of estuarine areas and of the larger coastal zone, it will be necessary to accept reservation of certain parts of a region or an estuary's borders for particular uses.

Control through zoning may seem the simplest, quickest way toward rationally planned use of estuarine lands. However, local governments, which almost everywhere hold zoning power, rely on property taxes for revenue and thus tend to favor land use that yields high tax revenues in the shortest time. Lacking trained advisors, local officials may not see how their decisions will affect the local environment and broad areas outside the local jurisdiction. Moreover, local governments usually prove weak against intruding economic interests. And in many fast-growing sections of the country local officials cannot use zoning to control land use because zoning is a power of municipal government and much of U.S. recent growth has taken place in unincorporated areas. In most states only a minority of counties enjoy authority to zone. (p. 960)

Linton, Dr. Thomas L., North Carolina Department of Conservation and Development

[Linton quoted below from: Hearings, House MM&F, 10-28-69]

We are working to establish better cooperation within the State to the best of our ability. Better cooperation is also needed among the many different agencies of the Federal Government which are involved in ocean affairs. Some 20-odd Federal agencies have an interest in this area, and the Federal-State relationship is thereby confused. Possibly the establishment of a federal agency of the type envisioned in NOAA would tend to solve this problem at the Federal level concerning Federal oceanographic matters.... (pp. 28-29)

It is impossible for the State to carry the full financial load alone. We must seek financial aid from the Federal Government.... (p. 29)

Marshall, Doreen, Mayor, Newport Beach, California, representing the National League of Cities and U.S. Conference of Mayors

[Marshall quoted below from: Hearings, Sen. Comm., 4-2-70]

In conclusion, I submit that the most effective way in which the Federal Government can help solve the problem of insuring coordinated coastline planning and management and protection of the natural environment is by making matching funds available for planning and land acquisition, and by providing a legislative framework through which the State and local governments can structure their relationship in a manner which will maximize the opportunity for innovation, rather than by imposing a rigid formula which would force the States to bypass local governments. (p. 869)

Michigan Water Resources Commission, Department of Natural Resources, "Great Lakes Shoreland Management and Erosion Damage Control for Michigan," February 1970

[Quoted below from: Hearings, Sen. Comm., 5-11-71]

The effects of high water and shore erosion along the Great Lakes range from nuisance conditions to major destruction of property.... Primary damage results from erosion of the shoreline, causing physical loss not only of land area but also trees and structures.... Greatly accelerated sedimentation carried by littoral currents impairs water quality,...[and] destroys fish and aquatic life habitat.... Secondary effects of high water are primarily increased cost and inconvenience of use of shore and lake facilities.... (pp. 308-310)

Areas which were damaged in the early 50's are well documented. Because of lack of adequate local controls developers are still being permitted to build in those areas and other areas susceptible to erosion damage. Now the Great Lake levels are at a critical stage. There may not be time to rescue the unwise development of the past 17 years. (p. 312)

Regardless of the magnitude of the erosion problems, erosion control is only one facet of shoreland management.... As the State's population increases and its economy expands, shoreland use pressures will intensify and problems and conflicts will be magnified. A few potential conflicts are listed: industrial-recreational; fish and wildlife habitat - marina development; private ownership - public access; developed high risk areas requiring protection - undeveloped high risk areas requiring no protection. (p. 313)

Mihursky, J.A.; A.J. McErlean; V.S. Kennedy; and W.M. Rosenburg, Biologists, Natural Resources Institute, University of Maryland, "Regional Planning and the Chesapeake Bay Environment: An Ecological Approach"

[Mihursky et al., quoted below from: N. Eng. Conf., 4-28/29-70]

Past regional planning efforts have, for the most part, taken little advantage of basic ecological relationships. This has happened for a number of reasons: (1) lack of understanding by the planner as to the relationships between man and his environment; (2) planning objectives that had economic motives which did not incorporate environmental values into cost-benefit analysis; and (3) lack of trained ecologists capable of providing useful inputs to regional problems of human ecology.... (p. 47)

Proper regional planning should permit resource use, protection, and development only if it is for the overall public good. The best decisions will depend on our ability to assess all costs and benefits that are pertinent to society and our environment. To properly weigh the impact of our decisions we must greatly improve our ecological information. We must be able to quantitatively evaluate the environment and determine its potentials and vulnerabilities with regard to man's encroachment. Thus, research must carry a major load in this economic-ecologic process, especially in our present learning period. There are many alternative decisions available to us with regard to industrial and domestic developments and operations; site locations; engineering designs; the extent of physical alteration really necessary to meet stated objectives; the quantity and quality of waste production; and many other aspects have not been properly explored from an ecological viewpoint in the past by local decision makers. (p. 54)

National Council on Marine Resources and Engineering Development, The Federal Interagency Committee on Multiple Use of the Coastal Zone, A Report on the Seminar on Multiple Use of the Coastal Zone, Williamsburg, Virginia, November 13-15, 1968

Increases in leisure, population, and national income, together with an expanding highway network and urban unrest, said Mr. [B. Calvin] Burns, [a Virginia consulting engineer], generate tremendous economic pressures for residential development in selected areas of the Coastal Zone. Mr. Burns added that in the face of this pressure, conflict between preservation and development is increasingly frequent, yet discussion of alternatives occurs with little or no information on the extent and the value of coastal resources.... Mr. Burns urged the appropriation of Federal funds for an adequate inventory of coastal and estuarine resources.... (pp. 11-12)

Mr. [Leslie] Carbert [of Pacific Gas and Electric Company] felt that an obvious problem at the present is that there is no declared statement of public purpose or interest with respect to the Zone and no planning mechanism to articulate such an interest.... (p. 13)

[Captain David J. Hart, a commercial fisherman from New Jersey] noted that in an attempt to increase access to the frontal beaches, the State of New Jersey was building roads through coastal marshes, the effect of which was a notable deterioration of the very resource being used to justify the expenditure. Though recreation exceeds industry as a source of income, such destruction occurs because the integrity of the Coastal Zone is not widely recognized and because actual economic values cannot be applied to it. Therefore it is imperative that there be increased expenditures to inventory and evaluate coastal resources.... (p. 15)

[Charles F.] Schwan concluded that the experience of governments in the Coastal Zone must be interpreted in view of their historic failure to view the Zone as an interrelated system. Consequently, what has been done is of limited use in assessing what may be done. Insofar as legal capacity to act is concerned, jurisdiction need not be a disabling factor. The more basic problem is coordination among functional programs affecting the Zone.... (p. 19)

Having taken the very broad perspective, Dr. [John] Krutilla [an economist with Resources for the Future, Inc.], then began a more detailed analysis of the basic problem in the decision process currently operating in the Zone: externalities, spillovers, or third party effects. The essence of any improved management system is the generation of data on the third party effects and the use of this information in decision-making. In the absence of these data, reliance is placed on control devices like zoning. Such controls are polar in their effects: they are either permissive or prohibitive.... (p. 31)

Mr. Peter M. Wilson of the National Association of Engine and Boat Manufacturers said that the desire of the private interests to cooperate in solving Coastal Zone problems was not always realized by the governments concerned. He attributed this to a poor pattern of communication on matters affecting the Coastal Zone and urged increased attention to this problem.... (p. 38)

Mr. R. Frank Gregg said that the real problem in Coastal Zone management was not in formulation of national goals and policy but rather in enforcing these at the local level.... (p. 41)

National Council on Marine Resources and Engineering Development, Marine Science Affairs, Annual Report of the President to the Congress

As population pressures along our coasts intensify, competition increases for the use of limited shoreline resources. Paradoxically, at the same time we seek to derive increased and multiple benefits from the shore, the by-products of technological progress continue to diminish its value. In all too many instances, polluted harbors and bays, oil-covered beaches, and eroded shorelines have accompanied economic development

along our coasts. The need for concerted Federal and local initiatives to arrest further shoreline degradation has now reached a level of some urgency. (1967, p. 71)

In view of the importance of recreation to public health and welfare, Federal legislation has been enacted to set aside a number of seashore areas for public use. At present only three percent of the shoreline of our States (excluding Alaska) has been set aside for public recreation and natural conservation, and wise land use of such scarce resources requires more understanding of the shoreline itself. (1967, p. 72)

Only rarely have lands and waters of the Coastal Zone been subjected to planned and controlled development. Further, the planning which has been done has not always resulted in effective allocation of resource uses among competitors. As a consequence, the trend in some places has been toward single-purpose uses, determined by immediate economic advantages to individuals, firms, and local governments. Industrial development; transportation and commerce; oil, gas and mineral production; private waterfront housing; public recreation and nature preservation; among others, have all pre-empted Coastal Zone areas without consideration either of harmonious relationships between users or optimum use of a scarce resource itself. (1968, p. 63)

Erosion is a common and often severe form of degradation of the coasts, caused by the action of tides, currents and hurricane-induced storm surges. Vast areas of valuable land have been lost through erosion, and the land washed away often deposits silt in navigation channels. Erosion may introduce pollutants into the water, and the material deposited may suffocate marine life.

Shoreline stabilization and protection, carried out by the Army Corps of Engineers, is well established as a Federal function. However, projects are authorized and carried out one at a time in response to local requests, and a longer range approach to setting priorities for such public Coastal Zone works may be needed. (1968, p. 65)

Many shallow estuaries and bays of our Coastal Zone are not used by commercial shipping and, consequently, have never been covered by hydrographic surveys for nautical charting. The increasing use of these shallow water areas by recreational boating and the contemplated conservation activities indicate that these areas should be surveyed and charted. (1968, p. 69)

Each study [Cheasapeake Bay and Seattle Harbor] has catalogued the present use and ownership of waterfront property and considered in some depth financial, legal, and administrative tools available for rational land use planning. Both studies noted a lack of coordinated land use planning at any level - among State agencies and between State and local agencies and the Federal Government - and the need for a data bank concerning the marine environment that affects land use. (1968, p. 70)

Two considerations may serve as guidelines to future collaborations. The first is that problems vary from one locality to another and involve

such finely detailed relationships that some governmental authority lower than Federal must be involved. The second is that mechanisms must be sought to facilitate transfer of study and research to action - both to reduce delay and insure authenticity of interpretation of studies. (1968, p. 72)

The Recreational Boating Safety Bill introduced last year reflects concern over the need to protect recreational boating participants while at the same time providing financial assistance to State boating safety programs. Among the research areas of particular concern are boat construction, fuel and ignition systems, operator visibility, and boat stability and load capacity. (1969, p. 68)

...There is a manifest national interest in the effective management, beneficial use, protection, and development of the land and water resources of the Nation's estuarine and coastal zone for the following reasons [including]:

The pressures of population growth and economic development impose an increasing number of conflicting demands upon the finite resources of the coastal zone....

Continued uncoordinated development activities in the coastal zone pose an immediate threat of irreversible harm to the coastal zone and its resources and a loss of the benefits it offers.... (1970, p. 35)

Rational management decisions on use of the coastal zone should be predicated on scientific information as to the unwanted and often unanticipated effects of man's activities on the coastal ecology. Such comprehension of the dynamics of coastal ecology is today largely absent. So are assessments of the natural ecological baselines in terms both of the physical properties and the biological content of coastal waters and interaction with the land interface. Also, monitoring capabilities to detect the changes already occurring in water quality are too limited to meet needs. (1970, p. 37)

Our Great Lakes, lesser lakes, and many estuaries are exhibiting losses in water quality that destroy their value for various uses-unfortunately at the same time use demand is sharply increasing. The prolific growth of obnoxious weeds and algae scums that induce eutrophication, then transformation into a marsh, eventually wipes out natural wildlife. Because early signs of pollution are subtle, public reaction usually does not occur until the pollution becomes advanced. By this time it is difficult to slow down the process, let alone reverse it. (1970, p. 37)

Following [the Santa Barbara blowout]..., a Presidential Panel was convened which reviewed the problem of oil spills and related matters. In its first report, which was primarily concerned with prevention and correction of oil spills, the Panel noted that the United States does not now have sufficient technical or operational capability to cope with a large-scale oil spill in the marine environment. (1970, p. 43)

Industrial liquid wastes are the largest source of pollution in coastal and estuarine regions, followed by municipal liquid wastes. Agricultural pollutants from land runoff, animal wastes, pesticides, and fertilizers add to the load of wastes ultimately reaching the ocean. Sewage from vessels and spilled oil are two highly visible sources of marine pollution. And a large part of air pollutants eventually end up in the ocean, directly or through run-off from the land. (1971, p. 23)

Current regulatory activities and authorities are not adequate to handle the problem of ocean dumping. States do not exercise control over ocean dumping, and generally their authority extends only within the three mile territorial sea. The Army Corps of Engineers' authority to regulate ocean dumping is also largely confined to the territorial sea. The Coast Guard enforces several Federal laws regarding pollution but has no direct authority to regulate ocean dumping. The authority of the EPA Water Quality Office does not provide for issuance of permits to control ocean dumping. The Atomic Energy Commission has authority only over disposal of radioactive materials. (1971, p. 22-23)

Nayudu, Dr. Y.R., Coast Commission, Juneau, Alaska, Representing Governor Egan

[Nayudu quoted below from: Hearings, House MM&F, 6-23-71]

When we examine the historical pattern of the development of the coastal area we see powerful forces of land and urban development, recreation, trade, industry, commerce, along with national security and conservation interests impinging and sometimes conflicting with this environment, and with each other. This conflict leads to an indiscriminate exploitation of this environment. Greater demands and uses for this environment's qualities and resources of the coastal zone adds additional dimensions to social complexities and conflicts of interest. (p. 212)

Nickerson, Eugene H., County Executive, Nassau County, New York

[Nickerson quoted below from: Hearings, House MM&F, 3-8-67]

Gentlemen, nearly one-third of the wetlands on the south shore of Nassau County has been lost to the dredger and developer. The hour is late. Failure to take protection action now will mean a loss of estuarine resources which can never be retrieved.... (p. 207)

...no coordinated study of Long Island's marine environment has ever been conducted. Thorough research and sound planning will help us understand the vital relationship between uplands, tidal marshes, and shallow bay waters. (p. 207)

States, counties, towns, and villages have all participated to some extent in action against water pollution. But there has been little regard for the interdependence of one area's action on another hundreds of miles away.... (p. 208)

North Carolina Marine Science Council, North Carolina's Coastal Resources: A Preliminary Planning Report for Marine and Resource Coastal Development in North Carolina, December 15, 1972

There are eight program areas that were considered of major importance in this preliminary planning report [including the following],...

Program Area: Minerals and Energy Resources

Problems:

1. Lack of an adequate comprehensive inventory of the mineral and energy resources which is needed for research planning and commercial development in the coastal zone.
2. Lack of verification and appropriate policies for ownership of mineral resources by State and private sectors.
3. Lack of an adequate method to evaluate the environmental impact of present and future development of mineral resources to meet growing concern for the quality of the environment.
4. Lack of information to properly manage ground water resources.
5. Lack of information on the market possibilities for coastal zone mineral resources. (pp. xxiii-xxiv)

Program Area: Transportation

Problems:

1. The conflict between the necessity to maintain channels by dredging and the environmental impact of dredging operations.
2. Inadequate policy for the selection of barrier island inlets to be stabilized.
3. The unknown economic impact upon the North Carolina ports by the possible construction of offshore deep-water terminals on the East and Gulf Coasts.
4. The Coastal Region lack of highway facilities of Interstate quality for service and for economic growth of the region.
5. Inadequate air service in the Coastal zone.
6. Lack of a coordinated state planning effort directed to transportation matters in the Coastal Region. (pp. xxv-xxvi)

Program Area: Recreation and Tourism

Problems:

1. Lack of adequate public access to recreation areas:
   a. Lack of good highways and airline transportation into the coastal region.

b. Inadequate publicly owned beaches and limited public access points to estuaries, rivers, and lakes.

2. Degradation of recreational facilities
   a. Overcrowding.
   b. Pollution.

3. Seasonality of recreation demand, especially in the northeastern coastal area.

4. Insufficient public park lands.

5. Need for meaningful conservation and development of recreational fishery resources.
   a. Inadequate assessment of the resources, their use and habitat near access areas.
   b. Destruction of juvenile fishes in nursery areas.
   c. Quality of fishing experience.

6. Uncontrolled land use accelerating demand for second homes with water fronts, mobile home parks on ocean front property, etc.

7. Inadequate insect pest management programs. (pp. xxvii-xxix)

Program Area: Environmental Quality

Problems:

1. Inadequate treatment and/or control of human, animal and industrial wastes and urban runoff discharging into coastal waters.

2. Insufficient information about and/or control of toxic heavy metals, pesticides, oil pollution, thermal effects and natural sources of pollution.

3. Deliberate destruction and adverse alterations of estuaries, marshes, and dunes by dredging, dredged material deposition, stream channelization and by inadequately controlled recreation and residential development. (pp. xxxv-xxxvi)

Program Area: Coastal Zone Management

Problems:

1. Lack of coordination of the various State and Federal management programs, lack of overall planning, and lack of responsiveness of coastal zone research programs to State needs.

2. Inadequate information concerning which portions of the coastal zone are most appropriate for existing and future use.

3. Inadequate funds to buy endangered lands and outdoor recreation sites. (p. xl)

Pautzke, Clarence F., Deputy Assistant Secretary of the Department of the Interior for Fish and Wildlife and Parks

[Pautzke quoted below from: Hearings, Sen. Comm., 6-4-68]

...today's expanding human population and industrial complex adjacent to our estuarine areas are affecting the environment upon which many species of fish and wildlife depend and consequently man. These

are problems which must be considered before any meaningful plans to conserve and develop our estuarine resources can be formulated.... (p. 59)

To state it bluntly,...while we have studied and are knowledgeable about a few areas, we have not, as yet, gathered sufficient facts on which to base recommendations for the protection of estuarine habitat on the scale that is needed.... (p. 59)

SENATOR MAGNUSON: Could it be that the Puget Sound area has, because of a lack of unified efforts from all branches of Government, needlessly suffered injury to some estuarine areas that could have been prevented with a program such as we now propose?

PAUTZKE: That is my interpretation.

I feel that Puget Sound and other areas have not deteriorated as much as some of the other States have, such as California, which lost almost 67 percent, but we have lost areas in Puget Sound and we have lost areas in Grays Harbor by filling and dredging, and these are areas that have multiple-use values from fish and wildlife and shellfish, that by all means the values should be truly studied and emphasized before a project is allowed that might be deleterious to these resources. (p. 63)

Peart, Ray, Supervisor, District IV, Humboldt County

[Peart quoted below from: Humboldt Sem., 5-7/8-71]

Humboldt County, like a great many others, doesn't have much money: we don't even have a biologist on the county payroll. So, when we get these complicated Environmental Impact Statements and we are asked to comment, frankly, we don't have the capability to do a really good job.... (p. 62)

Pfannstiel, Daniel C., Assistant Director, Texas Agricultural Extension Service, Texas A&M University, "A Perspective of Coastal Land Utilization"

[Pfannstiel quoted below from: Galveston Conf., 6-16/17-70]

...it might be useful to keep in mind the myriad of uses that are made of our coastal lands and waters....:

1. Industry (manufacturing, processing, etc. - proximity to raw materials as well as shipping)
2. Mining (oil, gas, sulfur, shell, and other extractions)
3. Ports
4. Transportation (shipping)
5. Recreation (boating, fishing, contemplation, swimming, surfing, etc.)
6. Fisheries (commercial and sports)

7. Aquaculture
8. Farming and ranching
9. Waterfowl and other wildlife
10. Dwellings (primary and secondary housing)
11. Dumping ground

Each of these uses is by no means a mutually exclusive one... And we would recognize that many of the specific ones are diametrically opposed to one another. Many of them - indeed most of them - are also in direct conflict with the delicate ecological system which our bays and estuaries sustain.... (pp. 7-8)

As we got into this program actually just a little over a year ago, we recognized that one of the big threats to the coastal areas was the ultimate destruction of the natural ecosystem. We recognized that the pressures for developments which interfere with such ecosystems were very great. (p. 9)

Quarles, John R., Assistant to Undersecretary for Environmental Planning, Department of the Interior

[Quarles quoted below from: Hearings, House MM&F, 10-28-69]

We all recognize the growth of competing demands for the limited resources in the coastal zone, and we certainly can see at this point in time that the prospect has no direction to head in other than the direction of increased intensity and increased squeeze upon limited areas and limited resources of the coastal zone.

In terms of whether this problem is being adequately met by the existing conditions under which use of different resources is determined, I think we probably would also agree that the present situation is not entirely satisfactory.

At this time the determination of usage is made on the basis of the free marketplace, of individual owners using their land for what they want to use it for, or selling it for what they want to sell it for.

This is in keeping with our American tradition. I don't think it proper to be critical of people for taking this approach, but the results of this approach applied across the board are not very satisfactory in terms of meeting our long-term national needs.

In terms of the system that presently exists, the determinations are made primarily on the basis of short-range considerations, and primarily on the basis of economic determinations.... (p. 21)

I would next turn to the question of planning for competing uses, and here I simply want to make the point that I believe good planning

must face up to the fact that different uses have different priorities... some of the alternative uses must be subordinated to give way to the priority of uses that must be satisfied within the coastal zone....

We are beginning to recognize that a strictly economic and commercial evaluation of life is leaving something out, and one of the things that is left out, particularly in our urban and metropolitan areas, is the matter of esthetics. (pp. 22-23)

Rouse, Frederick O., Jr., Chairman, Great Lakes Basin Commission

[Rouse quoted below from: Hearings, House MM&F, 10-29-69]

Certainly we would be the first to recognize whether or not existing implemented programs are fully meeting the needs of the Great Lakes area. They are not. We are deeply concerned with inadequate progress being made on limnological research, shore erosion control, shoreline management, pollution control, silt problems, recreational development, and preservation of scenic areas. Inadequate and timid management goals and policies for the development and use of the Lakes are also hang-ups we are painfully aware of - perhaps conditioned by inadequate funds.

These are matters which the State and Federal governments must face clearly around the conference table. But we hasten to assure you that the conference table does exist, and as long as it has its legs well shored up, we see no institutional impediments to using it. What we need most are:

1. A clear policy for the use and development of the Great Lakes.
2. More money. (p. 153)

...Although there are striking similarities between the Great Lakes and the oceans as regards problems and techniques of data collection and analysis, there are also many striking and important differences. The Great Lakes Basin is essentially a fresh-water, river system with very large, natural reservoirs. It has many management problems which are not amenable to the approaches appropriate to solutions of oceanic problems. On this basis, the Great Lakes Basin Commission feels that inclusion of the Great Lakes in the proposed legislation would serve to diminish rather than strengthen the excellent start made in coordinated joing planning for management of the Great Lakes. (p. 154)

Savage, Philip, State Planning Director, State of Maine

[Savage quoted below from: Hearings, Sen. Comm., 4-9-70]

Since November of last year the State of Maine has been engaged in a formal organized coastal planning effort.... There is a very great need for such a plan in the State of Maine. Maine is now experiencing many strong demands for the use of its coastal resources. Commercial

developers, land speculators, industrial concerns, conservationists and recreationists, along with many other interests are in competition for the use of this vital resource. The need for a coastal development plan to guide the use of our coastal resources is, therefore, immediate and well established.... (p. 894)

On the basis of our experience, and this is since November of last year, I would like to make the following general recommendations that would relate to any legislation to assist States in coastal planning and management.

The first conclusion gained from our experience is this plan will cost from $800,000 to $900,000 as a minimum. This is a very large sum for a State the size of Maine. In spite of extra efforts in raising revenue in the form of an income tax passed last year, Maine must have matching funds on one-third State, two-thirds Federal ratio if this plan is to be completed on time.

Second, we need help soon, especially to develop a land classification system designed to permit adoption and enforcement of appropriate land use controls. It is apparent that what this coastal planning program will encompass cannot be forecast or completely anticipated at this time. It is also very apparent that demands on the coastal region will continue to mount as the plan progresses. (pp. 893-894)

Coastal planning assistance at the Federal level should be developed with a consistent policy and administrative framework to avoid the existing duplication, conflict in goals, and piecemeal approach that is all too typical of present Federal planning assistance programs. Coastal planning programs at the Federal level should provide for program consolidation, integrated funding, and simplified administrative procedures under the control of a single Federal agency. (p. 895)

Saville, Thorndike, Jr., Technical Director, Coastal Engineering Research Center, Washington, D.C., "Research Needs in the Coastal Zone"

[Saville quoted below from: N. Eng. Conf., 9/71]

...Man developed from and by the sea, and has lived in one way or another by and with the sea ever since. Yet man's knowledge of the coastal area is appallingly small. I will try to indicate some of the needs for research to gain more knowledge to both use and protect the coastal area for the optimum benefit of man.... (p. 50)

First, there is a need to know and understand the physical processes involved in the coastal zone. This knowledge is needed to predict what may (or may not) happen in both long and short term. For example, we need to know the wave climate in an area in order to predict the best operating time for such things as offshore mining and construction, recreational sailing, and storm wave damage to our shore...

We need to know how these waves are generated; how they travel forward to reach the shore; how they change as they pass over shoals or around promontories, as they enter inlets and harbors, and as they break and run up on the shore face or cliff.... We need to know more about the forces which waves exert on boats, on structures, and on the shores themselves.... We need to know much more about the way sediment is moved along our beaches.... An equal need for research is on the movement of materials in an on-and-offshore direction.... We need to know more about the stress of the wind on the water, and the way in which it pushes that water toward the shore.... (pp. 51-54)

Let me turn now from physical problems to some of the biologic needs. We need to know the effects of any action which we take in the coastal zone on the overall environment both physical and biological. We need to know the changes which our actions will cause directly on the biology of an area, and those changes which will be caused indirectly because changing the physical environment in turn affects the biological environment. It is perhaps here that our greatest lack of quantifiable knowledge lies. There is not now an adequate basis for preconstruction or preoperational prediction of all of the significant ecological changes that might result from the impacts of man's actions in the coastal area.... (pp. 55-56)

I have mentioned physical and biological or ecological problems, but have not gone into the socio-economic field. But there are obviously implications involved, and much research is needed in this area, too. Labor-management relationships will have to take into account major changes in methods of operation.... Overall planning and zoning regulations to manage the new types of areas and new types of operations certainly need research and definition.... (pp. 59-60)

Scott, Robert W., Governor of North Carolina

[Scott quoted below from: Hearings, House MM&F, 6-24-71]

The coastal areas of North Carolina are currently being used for commercial fishing, sports fishing, other seashore recreation, mineral recovery, wildlife protection, water transportation and communication. Industrial development appears to be accelerating along our coast. More and more people are looking to the coast as a retirement area.

These many uses of our coastal area are often in conflict one with another and in conflict with long-run protection of the physical environment. We need a better mechanism for dealing with the conflicting claims for coastal and marine resource use. (p. 284)

Sessums, Roy T., Vice President, Freeport Sulphur Co., New Orleans, LA, (former director of public works for State of Louisiana, former dean of Engineering, Louisiana Polytechnic Institute)

[Sessums quoted below from: Hearings, House MM&F, 10-28-69]

...Insofar as man's adverse influence on the coastal ecosystem is concerned, it is generally of two types: pollutants and water management projects.... I respect the seriousness of pollutants, but my concern about their effects has lessened as response from municipalities and industries rise to the fore.... I do not mean to suggest that we will eliminate pollution entirely. Problems will continue, but I am confident of man's technology - I feel that at some point "downstream" he will cleanse the water faster than he despoils it....

The other type of influence is generated by water management projects, such as dredging and filling, dams and impoundments, navigational and water diversionary measures, and other such projects.... Such projects must continue, unless we are going to lower the quality of our life. Yet, the consequences remain. The estuarine areas are losing the enrichment from the rivers they need to sustain their productivity.... (p. 31)

Although the problems which face us as we look upon the coastal zone scene are complex - and some of these problems are just now beginning to emerge - it does not necessarily follow that our response needs to be equally complex.... We should seek to use to the fullest extent those agencies which are already providing able management of the many elements which together comprise the coastal zone. We should help them by providing funds and intelligent counsel. I do feel, however, that their efforts should be better coordinated....

Sims, Ivan, President of the Maryland Division, Izaak Walton League of America

[Sims quoted below from: Hearings, House MM&F, 3-8-67]

Chesapeake Bay has essentially the same problems existing in other estuaries on both ocean coasts and the Gulf of Mexico. Encroachment, inadequate knowledge of the ecology and hydraulics, pollution, inadequate management of the biologic resources, and increasing demands are the chief ones. (p. 259)

Encroachment is not quite as spectacular in the Chesapeake as it is in some other estuaries, such as some in Florida. In the aggregate, however, there has been a lot in the past, examples such as the horrible dumps around Baltimore can be found all too often. Extensive bulkheading and filling to provide real estate developments have not yet been undertaken, but the pressure for waterfront lots is building up...

A year or so ago a storm of protest arose when the Corps of Engineers announced a program of deepening the Chesapeake and Delaware Canal and the dumping of the dredgings in the head of the bay.... Out of the controversy came a compromise under which the Corps...dumped the dredgings into a deep hole in the upper bay. ...[followup studies] disclosed that the bay was measurably muddied for as much as two miles...the biological damage done is still to be evaluated.... (pp. 259-260)

Pollution in the bay has received a lot of well-deserved publicity recently...increasing pollution of the bay in Maryland is reflected in the area of oysterbeds closed by the State Department of Health.... The principal harbors are, of course, now polluted almost beyond redemption...

Our estuaries may be threatened also by the prevalent skyrocketing demands for electric power. A recently completed steamplant on the tidewater portion of the Patuxent River, a Chesapeake tributary, is being charged with serious interruption of the food chain because of steep temperature gradients resulting from the discharge of condenser cooling water into the river, and with copper contamination causing oysters to turn green and become unmerchantable.

A still larger plant proposed for the middle Potomac estuary is being viewed with alarm, and a proposed atomic plant of truly major size being considered for the western shore of the bay itself is considered by many as a direct threat to much of the bay.... The problems of thermal pollution are far from solved. (pp. 260-261)

Management of the biologic resources of the bay relies far too heavily on opinion of laymen, and to some extent on expediency. Maryland's laws controlling the bay fisheries are notorious examples of this because of their emphasis on local autonomy, authority and selfishness.... Perhaps Maryland needs some unifying influence such as H.R. 25 to help reshape its philosophy.

But more importantly, a vast increase in scientific knowledge about the bay is needed as a basis for management and protection. Maryland and Virginia have research programs underway, as does Johns Hopkins University of Baltimore. What is needed now is strengthening and expansion. (p. 261)

Slater, Lloyd, Technical Representative of the Environmental Quality Board of the Commonwealth of Puerto Rico

[Slater quoted below from: Hearings, House MM&F, 8-5-71]

...Puerto Rico really is not too different from many rapidly developing Coastal States in that pollution and stress are endangering a heritage that the island has, a marine heritage.... The stresses are due to human activity. Most immediate and visible are the stress of human waste, the intensive increasing use...by motorboats and recreational housing which is stilted to the shores, the mangroves. A less

visible, but more compelling in the long run, threat is industrial waste. Industrial complexes building up in the south coast of the island are discharging effluents into the sea.... (pp. 386-387)

South Carolina Water Resources Commission, South Carolina Tidelands Report, 1969

Prior to the Task Force approach to planning a beneficial use program for the South Carolina Tidelands, lack of a unified effort and single purpose pursuits of their responsibilities by both Federal and State agencies in this region reflected the need for improved coordination. There are also unresolved views as to public or private ownership. These conflicts tended to hamper all activities including those favorable to rational development and multiple-use of the many natural resource assets associated with this particular area of the State.... (p. 4)

South Carolina's continued industrial growth and the corresponding population expansion in areas adjacent to the State's tidelands have begun to compete heavily with the traditional means of utilizing the valuable natural resources found in this unique environment.... (p. 4)

On the basis of a general interpretation of the State's definitions of tidelands and tideland ownership, there has arisen in recent years numerous legal conflicts concerning which lands actually are owned by the State and held in public trust for the people and which lands are actually owned and/or operated by private interests. With the exception of isolated court cases brought to settle legal disputes regarding title to ownership of specific areas of tidelands, there has been, up to the present, little or no effort on the part of the State to inventory the full extent of the State's claim to ownership of these lands.

Reluctance in the past on behalf of the State to assert its authority and likewise develop a suitable formula for clarification and settlement of the legal questions relating to ownership of the South Carolina tidelands, stemmed from the general misconception that these submerged lands were of no particular value to the total growth of the State's economy.... (p. 5)

The erosion of beaches and ocean front property in South Carolina is significant and the property and recreational opportunity thus lost is of increasing value as the development of the State continues. The development of sound solutions to beach erosion problems requires extensive research and is expensive. The State, over the past 20 years, has fallen short in the area of financial participation necessary to rectify continuing beach erosion problems. Federal participation in both planning and financing beach erosion studies and programs is essential in providing adequate solutions to these problems.... (p. 6)

Four South Carolina State agencies exercise their authority to grant or lease State lands for specific uses. Two of these agencies,

the State Development Board and the State Ports Authority, are responsible for providing lands and rights-of-way in connection with Federal navigation projects. The former has this responsibility along the Atlantic Intracoastal Waterway and the latter has this responsibility in association with the three State ports.

Maintenance dredging and disposal of dredged materials in South Carolina's coastal waters represent a significant conflict when contrasted with the efforts of the South Carolina Wildlife Resources Department and others to preserve and enhance the tidelands habitat and efforts to protect natural and aesthetic values. Future efforts to resolve conflicts between the responsibilities of these agencies should be directed toward centralizing the authority for granting lands by permit.... (p. 6)

Stewart, Dr. Harris B., Jr., Director, Atlantic Oceanographic Laboratories, ESSA

[Stewart quoted below from: Hearings, House MM&F, 10-29-69]

It is my contention that the cost of doing something, although an immediate cost, is considerably less than the eventual costs to society of doing nothing - it is the "Tragedy of the Commons" exemplified.

The real problem, it seems to me, is that we as a people are prone to defer the immediate costs because they are immediate. The unavoidable result is that we eventually are forced to pay the much greater costs of cleaning up the mess that we were unwilling to pay the relatively small costs to avoid in the first place.... (p. 109)

Although we have learned a great deal about the coastal zone, much additional information is needed. The research effort should be aimed at "understanding" this Nation's coastal zone. This means an adequate understanding of the dynamics of estuarine circulation, the advection and the diffusion, the water budget, the movement of sediment as it relates to channel filling and deepening and to coastal erosion and deposition, the life histories of the organisms that populate our coastal zone, and their very complex interrelationships with the highly variable coastal zone environment, the basic physics of shoaling and breaking waves and of longshore and rip currents, the development of inundating storm surges related to intense coastal storms, the coastal runup of tsunamis, the movement of hurricanes, the capability of coastal zone waters to receive wastes without undesirable side effects, the ocean-atmosphere interactions, and the land-sea interactions.

It is only with an understanding of the coastal zone as a highly complex and highly variable ecosystem that we can predict what the overall effect will be of man's proposed changes to the system. (pp. 109-110)

Teeters, Robert L., Jr., Office of the Chief of Engineers, "Present and Future Demands Upon the Coastal Zone"

[Teeters quoted below from: Williamsburg Conf., 11-13-68]

The importance of Coastal Zone conflicts is determined by their frequency, severity, and areal extent. Significantly, I think, most Coastal Zone conflicts are surprisingly limited in areal extent--exceptions being oil spills and pollution effects on migratory fish and wildlife. Also, a large percentage of the frequent and severe conflicts involve ecological relationships. Unfortunately, a good deal of what we know of the interrelationships of organisms and their environment is not being applied to these problems, and the gaps in our ecological knowledge are only slowly being filled.... (pp. 86-87)

In short, the major problems caused by conflicts in the Coastal Zone appear to be:

1. Effects of industrial wastes, oil spills, insecticides, and waste heat on biological resources.
2. Competition for shoreline uses, especially as it limits public access for recreation and aesthetic uses.
3. Wetlands versus fill uses.... (p. 88)

Finding that the existing system of decision-making is inadequate, is considerably easier than finding workable ways to remedy the defects, for at least two reasons. First, the problem of evaluating non-market benefits and costs in competition with monetary benefits and costs stubbornly defies systematic and theoretically satisfying solution.... Second, spillover situations are resistant to change, particularly in cases where an agent can reap most of the benefits his action produces, but does not have to bear all the costs.... Moreover, the benefits are often strongly concentrated and visible, while the costs are dispersed and difficult to demonstrate. A third factor which makes evaluation of Coastal Zone uses and impacts so troublesome is the lack of knowledge we have on essential processes. In the estuarine portion, particularly, the complicated interacting physical and biological systems make specification of cause and effect very difficult.... (pp. 90-91)

Towle, Dr. Edward L., Director, Carribean Research Institute, College of the Virgin Islands, St. Thomas, U.S. Virgin Islands

[Towle quoted below from: Hearings, Sen. Comm., 5-4-70]

Islands are special entities, not only in a biological, geographical, and geological sense, but in an administrative-management sense as well. On the basis of our experience with environmental research programs at the College of the Virgin Islands, where we are attempting to learn something useful about the Virgin Islands and the eastern Antilles island system, I can assure you we still have only very rough understandings of island coastal zones, and our information on the "operating procedures" or the mechanisms one would use for small land ecosystems is still marginal and highly selective.

I am certain the experience of the Aleutians, Guam, Hawaii, and the Florida Keys is not dissimilar. It is increasingly apparent, moreover, as we work with Caribbean Islands, that standard, continentally-derived approaches and practices are not readily adaptable to the environmental problems of insular systems. Estuarine models, engineering techniques, planning standards,...some pollution control methods, and even environmental teaching materials must be localized and adapted to the insular microcosm or condition. In a nutshell, islands are different. (p. 1158)

The Virgin Islands are, however, in a unique position to develop, under the provisions of a coastal zone management policy, a wide spectrum of environmental planning practices and procedures, expressly designed for island units and systems... With guidance and assistance from the Federal Government, we look forward to learning enough about our uniquely encompassing coastal zones to develop and test our planning procedures and management techniques... (p. 1158)

In conclusion, may I express only a sense of urgency and genuine concern. With maximum coastlines and minimum land area, with rising population--last decade we doubled in less than 10 years.... With expanding industry--we do have an oil refinery, a Harvey enterprise and with shrinking open space, and with a periodic inundation by waves of American tourists seeking a restful and health dialog with an island in the sun, the coastal environment of the American Virgin Islands is under enormous stress. Sound coastal zone management programs, blending Federal and local energies, talents, techniques, and resources would go a long way toward solving the problem. (p. 1159)

Train, Russell E., President of the Conservation Foundation

[Train quoted below from: Hearings, House MM&F, 3-9-67]

More effective federal effort to help resolve estuarine problems is required for a number of reasons. First, although a few states have progressive legislation protecting estuaries and regulating their development, the majority do not, in spite of long efforts by concerned local governments and civic groups. As a result, not only is there a loss if irreplaceable resources in those lagging states, but interstate and probably oceanic effects of estuarine destruction diminish the value of other states' conservation programs and those of the Federal Government. (p. 435)

Second, while the harmful effects of water pollution can usually be repaired, dredging, filling and excavation of estuaries, cause irrevocable damage to aquatic habitats.... The increasing rate at which navigation improvements, housing, highways, and commercial developments are demanded at the expense of estuaries requires the establishment of a permanent federal system to preserve the most valuable of these areas as quickly as possible. (p. 435)

Finally, while it has been argued that the institution of a federal program may discourage purely local action,...[t]he fact is that, in general, under present local and state programs, estuarine areas are not being adequately protected. (p. 435)

Train, Russell E., Undersecretary, Department of the Interior

[Train quoted below from: Hearings, House MM&F, 10-29-69]

The fact is that present planning and development now proceeds on a piecemeal basis, with unplanned and unregulated modification of the estuarine and coastal zone. As a result, incompatible uses of the coastal areas often are developing adjacent to each other.

We are in danger of allowing unfortunate destruction of fish and wildlife resources and the habitat on which they depend. We are losing forever the opportunity to set aside areas for recreational use, and we are permitting unnecessary damage to scenic areas and aesthetic qualities generally. There is obviously need for action. (p. 135)

Treichel, Dr. George, San Francisco State College, Ecological Consultant to the Sierra Club

[Treichel quoted below from: Hearings, House MM&F, 6-23-71]

Coastal and estuarine protection is a national issue. Not only are these areas enjoyed by the inhabitants of noncoastal as well as coastal States, but the biological resources contained in estuaries in particular have enormous significance for the entire nation. It is illogical to concede this point, as virtually every scientific study has, and then to turn around and vest the bulk of coastal management authority with the same political entities that have thus far failed to protect the public trust.

State participation in the program is entirely optional. An assumption that appears to underlie much in these bills is that the limiting factor up to this date in coastal and estuarine management has been a lack of State funds, and that the major action needed of the Federal Government is to provide money. We seriously doubt that this is the case, and instead suspect that in those States that have been negligent in coastal zone management the reason lies in a lack of policy commitment rather than a shortage of funds. (p. 257)

U.S. Department of Commerce, Office of Coastal Zone Management, NOAA, Final Environmental Impact Statement, State of Washington Coastal Zone Management Program, 1976

Following are a list of problems the Program is attempting to alleviate,...:

There are a variety of demands on the coastal resource, each competing for certain segments of the resource. Certain resources can withstand and support the demands; some cannot.

There are many classes of interest or activity which use and involve coastal resources such as recreation, environmental protection, power generation, defense, commerce, resource pollution, industry, communication, transportation, historical significance, protection from destructive natural forces, food, and aesthetic preservation.

Each of the above interests uses or affects coastal resources, but balancing each need, knowing how much of the resource to allocate to each interest, and knowing what the proper responsibilities for each level of government for each interest is difficult.

There are a variety of public and private organizations which manage, use, and/or depend on the coastal zone. The needs of these entities may conflict, are not always known, are not always coordinated, and not always met.

The needs of various competing interests are not always clearly and comprehensively known, thus creating conflicts and preventing the best prioritization for use of the coastal resources.

Various areas in the coastal zone are pre-empted by uses which do not need, are not related to, or are destructive of the coastal management and such conditions will worsen without comprehensive management and control of the use of the coastal zone.

Much of the Coastal Zone and adjacent areas are in private ownership, and unguided, unrestrictive construction of privately and publicly owned areas is not in the best interest of the public.

Knowledge of the nature, extent, tolerance, capability, value, and importance of the coastal resources is incomplete, out-of-date, and fragmented. (pp. 24-25)

U.S. Department of the Interior, Federal Water Pollution Control Administration, The National Estuarine Pollution Study, 1969

Volume I:

Increasing use and misuse of the Nation's estuaries have created and intensified many problems. Once productive shellfisheries have been completely smothered by sedimentation or closed by pollution; once deep

and beautiful harbors are silted up and unnavigable, except for carefully marked dredged channels; passage of anadromous fish is blocked by polluted estuarine zones; thermal discharges affect entire ecosystems; diversion of rivers has caused salt water intrusion into groundwater; and untreated or inadequately treated municipal and industrial waste discharges have damaged fisheries, added to siltation, and made many areas unsuitable for the increasing recreational use the present society demands. (p. I-4)

Water transportation is not the only type of transportation consideration for estuaries. Since a major percentage of large cities are located on estuarine systems, there is considerable pressure to develop fill areas for airports which then utilize the long overwater approaches to keep the jet noise away from developed areas. The water areas offer a barrier to land travel that must be overcome with causeways and bridges which can interfere with navigation or cause habitat damage. On the other hand, peripheral roads offer some of the more scenic routes available and are frequently the only undeveloped area on which roads can be built. (p. II-34)

One of the major constituents of municipal and many industrial wastes is decomposable organic material. Such materials consist primarily of carbohydrates from plants and paper, proteins from animal matter, and miscellaneous fats and oils. The decomposable organics are not necessarily detrimental by themselves but exert a secondary effect by reducing dissolved oxygen in the water....

Another class of materials, primarily organic, that can have considerable impact on the estuarine ecosystem are flesh-tainting substances. Generally these materials are contained in industrial waste effluents and they result in offensive tastes, odors and colors in fish and shellfish.

The salts of heavy metals are fairly soluble and stable in solution. Consequently, they will persist for extended periods of time. Many of these are highly toxic to the aquatic biota, and since many marine organisms exhibit the ability to accumulate and concentrate substances within their cell structure, the presence of these metals in small concentrations can have deleterious effects.

...Conversely, an oversupply of all necessary trace mineral salts and vitamins can stimulate growth, providing satisfactory conditions of temperature, salinity and dissolved oxygen also exist. An oversupply of inorganic nutrient salts, such as those of nitrogen and phosphorus, may be associated with drastic shifts in the composition of the aquatic community.

One of the many unfavorable effects of municipal and some industrial wastes is the contamination of the recovering environment with bacteria, viruses and other organisms of public health significance. Pathogenic organisms, especially those from the intestines of warm-blooded animals, frequently persist for sufficient periods of time and distance to pose a threat to the health and well-being of unsuspecting water users. Secondary

chances of exposure to these organisms exist through the contamination of shellfish which can be harvested for food.

Among the waste products that are frequently introduced into the estuarine environment are some directly toxic to marine organisms. Toxic materials may exhibit a short, catastrophic impact or a more subtle long-term interference with growth and reproduction processes. The end result is to create a biological desert in which no organism can survive. The pesticide group is of particular concern in the estuarine zone. Estuaries are the terminus for most of the major river systems, and as such they tend to concentrate the waterborne materials carried in by the large terrestrial drainage systems....

The addition of large quantities of heat from industrial cooling water constitutes a form of pollution which must be considered. The entire ecosystem may be stressed by thermal pollution.... Heat affects the physical properties of water, the rates at which chemical and biological reactions occur, and can kill living organisms.

Man's activities may affect the rate of sediment inflow, deposition, and outflow by purposely or inadvertently upsetting the natural balance. If upstream erosion is increased due to poor land management practices, the load carried will be increased. Conversely activities along the coast can result in increased shore erosion, removing more sediment than is contributed.... The detrimental effects of sedimentation are reflected in an impairment of uses such as navigation, recreation, and fish propagation.

The effect any pollutant has on an estuarine environment depends on where it goes, how strong it is, and how rapidly it is assimilated or flushed out of the environment. All of these conditions depend on water movement and circulation patterns which are in turn governed by the relationship of tide and river flow to estuarine shape and size. Physical modifications such as the dredging of new or deeper channels...can cause subtle changes in water movement that can change the balance of environmental conditions in an estuarine system and result in gradual undesirable changes in the ecosystem in addition to direct habitat damage. (pp. II-52-56)

...The major sources of pollution are these:

(1) Those sources associated with the extent of development of the estuarine zone, including waste discharges from municipalities and industries, and land runoff from these as well as agriculture;
(2) Those sources associated with particular activities of great pollutional significance, specifically dredging and filling, watercraft operation, underwater mining, and heated effluent discharges:
(3) External sources having impact derived through flow regulation and upstream water quality.

Volume II:

...In the Chesapeake and South Atlantic regions the state of shoreline development is low to moderate. Of the total 4,315 miles of

recreation shoreline for the two regions, only 154 miles are public recreational areas, a mere 4 percent of the total. The level of development of the Gulf coast is relatively low. Out of a total 3,642 miles of recreation shoreline only 81 are dedicated to public recreational areas, a total of only about 2 percent. The Pacific Coast, which is composed of 75 percent bluff type shoreline, in areas suitable for recreation provides 10 percent of this length for recreation, or almost 300 out of 3000 miles. (pp. IV-121-124)

It must be noted,...that increased harvesting of industrial fish is ultimately dependent on existing renewable supplies of the resource. Although some sizeable stocks of under-utilized species exist, such as the thread herring in the Gulf of Mexico, other stocks may be overfished, now or in the future. Further degradation or destruction of the estuarine nursery grounds for menhaden could well reduce or eliminate this major domestic source of industrial fish. (p. IV-297)

Most of the reduction in domestic oyster production, however, can be attributed to man's activities in the estuaries. Examples of the diminution or extinction of this resource are many. New Jersey's Raritan Bay, an outstanding producer of oysters for the New York market in the nineteenth century, is now almost barren of this shellfish, mainly due to municipal and industrial waste discharge. A study in Shelton, Washington, indicated that sulphite waste discharge from paper pulp manufacturing almost surely brought about a serious decline in the oyster population. (p. IV-301)

The diminution of the continental salmon fishery provides a classic example of the damage inflicted on fisheries by biophysical modification. As dam-building, lumbering, and other kinds of man's activities have increased, the once-abundant salmon catches declined. The Atlantic Salmon has almost completely disappeared from the east coast. On the west coast, reduction in the quality and quantity of freshwater, sedimentation in spawning areas, pollution of the transitional zone in estuaries and heavy fishing pressure by both sport and commercial fishermen have combined to reduce the once-flourishing salmon industry. (p. IV-302)

Perhaps the greatest recent change in user group pressure results from the tremendous growth of permanent residences constructed in coastal and estuarine locations. Recreation amenities provided by these areas is a prime factor in this trend. Although growth figures are not uniformly available, the growth of permanent and "second" homes appears to be general throughout the Nation, particularly in outlying "suburbs" tied to metropolitan job centers by expanding transportation networks. This growth of permanent users of the estuarine zone is further increased by the phenomenal expansion of retirement communities in such areas as Florida, Texas and California. (p. IV-329)

These figures are reasonable statements of pressures from urban populations, but the exterior suburban and rural populations presently not served by sewers will undoubtably contribute further significant liquid-bearing wastes to the estuaries. For example, beach front and

estuarine communities, particularly resort-oriented developments, have traditionally and continue to depend in large degree on septic tank disposal of municipal wastes.... Furthermore, many coastal communities were originally sewered with primary treatment facilities. These facilities, often discharging directly into shallow back bays, are no longer adequate to meet increased development, density pressures and the longer duration of stays caused by burgeoning "second home" markets. The communities, limited to residential tax bases, are hard-pressed to finance facilities adequate to handle peak loads reached for relatively short periods in the critical summer months. (p. IV-335)

In terms of the generally quoted measurements of strength and volume, the FWPCA estimates that manufacturing establishments are responsible for about three times as great a loading as that caused by the Nation's population. Moreover, the volume of industrial production, which gives rise to industrial wastes, is increasing at about 4.5 percent a year, or three times as fast as the population growth rate. (p. IV-337)

Solid wastes, particularly those associated with urban areas and concentrations of industry, must be recognized as major hazards to the maintenance of a desirable estuarine environment. The problem of disposal of solid wastes becomes particularly acute as available land surrounding central cities becomes built-up. Traditionally, wetlands have been considered convenient sites for the disposal of all types of unwanted material, from demolition wastes to tricycles. It is estimated that the amount of land necessary to store and/or process solid wastes for ultimate disposal will nearly double from 1966 to 1976. (p. IV-344)

This [navigation channel dredging] is probably the most widespread and constant permanent modifying activity in the estuarine system. Dredged navigation channels must be kept clear for navigational purposes, and the bottom is constantly being removed. Both of these conditions preclude the large-scale use of such areas for purposes other than navigation.

The disposal of dredging spoil may also be a prohibitive estuarine use when it is deposited in other parts of the system or on adjacent marshes or land. The destruction of habitat which can result from such disposal will at a minimum remove the areas used from productive participation in the estuarine system.

The prohibitive impact of dredging may, however, affect an entire system, particularly where a major channel realignment or deepening occurs. The prohibitive impact of such modification may not be in direct destruction of habitat, but may result from a change in water circulation patterns. (pp. IV-435-436)

Although generalizations about the effects of man's activities on estuarine ecology are hazardous at best, the following results generally characterize the modifications associated with significant waste discharges, dredging and filling, and construction of physical structures either on fresh water inflows or in the estuaries themslves:

(1) Productivity of biotic communities is generally reduced. This is due to many factors including reduction or over provision of nutrients, abrupt changes in temperatures and salinities, changes in circulation patterns, and destruction of physical components of the system.

(2) Species diversity and organization is simplified.

(3) Trends toward severely modified ecosystems are established. (p. IV-496)

Volume III:

No uniform state-level estuarine law framework exists; there are, instead, many laws, often conflicting, which affect the estuarine zone. The State's estuarine legal system is a confusing and complex blend of water rights, land ownership claims, use conflicts, and State, Federal, and local laws which vary from area to area and are often subject to varying interpretation and constant litigation. (p. V-100)

A survey of intergovernmental relations in the coastal zone disclosed that:

> "State statutes establishing distinctions between public resources and private property and the extent of State responsibility for management of public resources have little in the way of uniformity. Even if legislatively clear, the distinctions are difficult to fix on the ground. The resulting situation is a legal nightmare." (p. V-105)

The confused legal situation is a direct cause of the failure of local government in preventing uncontrolled growth in the estuaries. Divided ownership, disputed titles, unresolved public use rights, and varying State, Federal, and local laws considerably complicate the attempt to achieve planned land-water management. (p. V-156)

A second reason for the difficulty local agencies encounter in attempting to evolve rational and comprehensive management policies is programming deficiencies. Almost all coastal local agencies lack the staff and funding capabilities to plan, decide, and implement regulations for compatible land and water uses. One survey reported that some local authorities were unaware of their jurisdiction and control powers over the coastal zone and its resources.

Decision making is also hampered by fragmented jurisdictions. Almost all local governments are too small to encompass the entire estuarine area; they approach problems on a piecemeal basis rather than by an overall view of the suitability of uses and the total resource value of estuaries. In addition, local governments, including major metropolitan areas, have little impact on upstream water resource projects that can bring about major changes in the quality and amount of fresh water inflow to the estuary.

Another problem is that of coordination within local governments. As at other levels, local departments often work at cross purposes. The port development agency may favor filling estuaries at the opposition of the parks department; or the building of public-access roads by the

highway department may destroy the wildlife protected by the fish and game department. (p. V-159)

Strong economic pressures often work against preservation of estuaries. Heavily dependent on property taxes, local governments need the revenues brought in by "developed" land. Similarly, heavily taxed private land owners find selling their land to developers more profitable than retaining it in its natural state. Because of these immediate and tangible benefits and the insistence of industrial, commercial and residential interests, it is very difficult for hard-pressed communities to preserve such things as the habitat and recreational values of the estuaries for long-range benefit. As a result of these compelling needs for revenues and profits, estuaries are dredged, filled, and developed. (p. V-160)

U.S. Department of the Interior, Fish and Wildlife Service, National Estuary Study, 1970

Much of the most damaging use of estuaries - to create land - is not an essential on-site use. In many cases, the shore and adjoining shallow waters have been filled with material dredged from the productive bottoms together with sludge and garbage from the cities to create land for homes, motels, industries, roads, airports, and various service establishments. Dredging and filling is often carried out to create a series of alternate fingers and channels with a maximum number of water-front lots for residential housing. Such dredging and filling for permanent or seasonal housing can destroy the natural environment which is responsible for the high value of the home sites. Although each home has a waterfront, the water itself may become polluted and unfit for fish life or swimming. The filling eliminates public use of the shore and access to the water, including enjoyment of the shore and water landscape. It also eliminates the habitat and basic nutrient sources of the quiet tidal edges and marshes, and the dredging of submerged material deepens the water and thereby decreases the most productive portion of estuarine bottom. (pp. 53-54)

In earlier times when the Federal interest was narrowly construed, the waters and their inherent values were easily neglected by the Federal government. Also the submerged lands having unknown intrinsic values were considered worthless and were easily neglected by the States. Further, the shared responsibility in the Coastal Zone proves the adage of everybody's responsibility being nobody's; it has encouraged neglect of ill-defined responsibilities. (p. 62)

Both Federal and State agencies have carried out or encouraged programs of drainage and reclamation of private wetlands in the estuarine zone for mosquito control, timber production, agriculture, industry and urban development. Much of this drainage has been ill-advised and uneconomic. Substantial public interests in fish, wildlife and scenic beauty have been sacrificed under these governmental programs to further private development and gain. (p. 62)

Real property tax laws and policies of assessment presumably can encourage or discourage development of estuarine lands. Taxing on the highest potential use rather than present use often forces owners to sell, particularly if the owner is financially unable to support preservation of a primitive or conservation use. However, this effect is largely one of timing; if the demand exists, the sale and development probably would eventuate regardless of taxing policy. (p. 63)

[Zoning] has been a power delegated almost entirely to local governments. Also, it has been generally accomplished through readily changed administrative action rather than by statute. This has often permitted local pressures to influence decisions in the direction of private gain at the expense of public interest. It is simply a reflection of values perceived at the community level rather than at a State or National level. (p. 64)

There is no agency which has overall responsibility at the Federal level for the management of estuaries and similar areas of the Great Lakes. There are a number of line agencies which carry out programs directly or provide financial or technical assistance to others in programs which affect these lands and waters. At times these programs may be duplicative or in conflict with one another. (p. 67)

As in the case of the Federal Government, the States do not have lead agencies responsible for the overall management of their Great Lakes and estuarine areas. They have the same mixture of line agencies--each having responsibility over specific programs affecting these lands and waters. Again the programs may be duplicative or in conflict at times. (p. 71)

The majority of local communities are unable or unwilling to provide adequate protection to the environment and the associated living natural resources of the estuaries and the areas of the Great Lakes within their jurisdiction even though broad social values to the people of the State and the Nation are involved. Most of the communities are dependent upon local revenue to finance the services which their residents require. They tend to favor those residential or industrial developments of land and water areas which provide the highest direct return. (p. 72)

Generally there is a shortage of available funds in most of the concerned States to adequately protect, develop, or manage their estuarine areas. (p. 78)

Volume II:

Estuary-located cities of the Nation are notorious for burying their marshes and tidelands in rubbish and garbage; for defiling their water with sewage, industrial wastes, soil sediments, and street washings; and for flaunting waterfront eyesores on the landscape. (p. 106)

Dredging to build and maintain harbors and navigation channels, including the disposal of dredged material on estuarine flats and marshes, continues to be one of the most important causes of physical alteration of estuary bottoms and shorelands. (p. 107)

Dredging is also done in estuaries to obtain sand, gravel, and shell for construction and other uses; in some cases considerable overburden must be removed, causing a spoil disposal problem as well as turbidity and silting. (p. 107)

Biocides, especially long-lived insecticides, such as DDT, and heavy metals probably are the greatest threat to estuarine fish and wildlife. Petroleum wastes and spills as well as organic chemical wastes also can cause damage and impart disagreeable tastes to fish as well. Sewage released in estuaries may result in hazard to human health and may reduce dissolved oxygen to harmful or lethal levels for estuarine life. Heat is added to estuaries by industry and especially by thermal electric plants. Such heat additions can alter the heat budget of the water usually to the detriment of the life adapted to the former conditions. The heat can aggravate other pollution effects by increasing oxygen demands of aquatic organisms while reducing the capacity of the water to absorb and hold oxygen. (p. 108)

Drainage of coastal marshes and lowlands for mosquito control and other purposes as well as use of insecticides in such areas can be highly damaging to fish and wildlife if the work is not properly coordinated with the needs of these resources. (p. 108)

Intense, comprehensive study of the life of estuaries is a fairly recent undertaking, limited essentially to the last few decades. Many, many intriguing and fundamental questions about estuarine life beg answering. Scientists are busy in this diverse field, but more are needed. (pp. 143-144)

There are provisions in Federal and most State laws for establishment of wildlife refuges, although additional funding certainly could be used for this purpose. But there has been no recognition prior to that of the Estuary Protection Act (P.L. 90-454) that it is desirable in the overall public interest to reserve estuarine zone areas for their varied productive and scenic values. (pp. 144-145)

A review of the available information on state plans and policies results in the following conclusions:

(1) Resource planning on a State and local level tends to be provincial. Most States have been, and some still are, looking at an estuarine program only as it affects their own particular territories...

(2) Estuarine and marine resources generally have not been considered in overall State planning....

(3) The multiplicity of State agencies (as well as Federal and local) involved in natural and physical resource planning and management can result in poor coordination and deficiencies in comprehensiveness of State efforts....

(4) In a number of States there is a lack of authority to acquire lands. Even where authority exists, it is often hampered by a lack of

funds for acquisition and lack of a well-defined acquisition program....

(5) In several of the States, ownerships of tidelands, estuarine areas, bays and bordering coastal marshes are not clearly defined....

(6) In some instances, there is a lack of State authority to regulate activities for protection of estuaries. In others, either no regulatory agency has been established or there are a number of agencies each charged with one specific regulatory function. Further, some agencies lack enforcement capability even though they have the regulatory authority.

(7) State management in the estuarine zone and Great Lakes is hampered in many ways by existing legal and institutional arrangements. There is a preponderant dependence of local governments on real property taxes and a consequent virtual necessity for them to encourage development of estuarine areas to increase tax yields regardless of the consequences to public amenity values. Also, there is inadequacy of legal process in assessing liability for damage that results from diffuse sources that are difficult to trace.... Further, there is a need to improve the law with regard to limits of liability, both at the State and Federal levels....

(8) Inadequacy of funding is a universal problem of governments, and State policies in many cases have aggravated the problem with respect to estuarine zone management....

(9) There are a few instances of a lack of coordination or agreement between bordering States as to the preservation of jointly held resources.

(10) The public is not being adequately informed of the many problems facing the States in their efforts to protect the estuaries, nor is it being informed adequately as to the value of these natural areas. (pp. 234-237)

Wallace, David, Director, Marine and Coastal Resources, State of New York

[Wallace quoted below from: Hearings, House MM&F, 10-28-69]

The management of the coastal resources of the United States historically has been the responsibility of the individual States. I am emphasizing management and development. Federal and State laws have recognized the States' role. However, as interstate problems have arisen with increasing frequency in the coastal waters and resources have become shared by more than one State, the interstate compact has become fashionable to have in such matters. Many of these efforts have been confined to planning activities with little delegation of management authority.... (p. 53)

The states have attempted to cope with the coastal management problem in many ways. Efforts from State to State have varied widely depending upon the financial resources and the legal structure in existence there. Some states have given low priority to their marine matters since many people have had the mistaken idea that the marine

resources were inexhaustible and the bays and the adjacent seas were capable of absorbing unlimited quantities of waste and dealing with other concentrated abuses. Usually numerous agencies within a State have varying interests in the coastal zone. Often in the furtherance of one goal by one agency the basic resources controlled by another are damaged or destroyed. Local government has frequently tended to disregard altogether the importance of its marine resources and has failed to use whatever mechanisms that might be available to it in preserving the various values.... (p. 53)

The States need financing support for research on our coastal resources in that manner. They need assistance to do the planning to carry out these mandated programs. The Federal Government can and should participate in this effort. It should be directly involved in programs which affect national interest and its participation is needed directly in dealing with those waters controlled jointly by several states. (p. 54)

Wenk, Dr. Edward, Jr., Executive Secretary, National Council on Marine Resources and Engineering Development

[Wenk quoted below from: Hearings, House MM&F, 10-28-69]

States already have the responsibility for the management of these resources. They have often lacked the regulatory management capabilities needed and they have been faced with a diversity of coastal jurisdictions and the absence of ecological information.

The intent of the [CZM] program therefore is to strengthen the States' capabilities, lessen the need for Federal intervention, and facilitate integration of planning, conservation and development programs among diverse public and private interests.... (pp. 16-17)

We have a problem that has developed as a consequence of neglect, of ignorance, and just plain human greed. Someone has to look out for the public interest. I believe the officials of State governments have wanted to do this. We want to make this possible....

To do this, however, means more than simply desire. It means knowledge. Here, I think you see a pattern reflected in all of these [proposals]..., to pay more attention to the environment and to undertake that research necessary in order that we can assess the impact of man on our ecosystem. (p. 18)

Wenk, Dr. Edward, Jr., Professor of Engineering and Public Affairs, University of Washington

[Wenk quoted below from: Hearings, Sen. Comm., 3-9-70]

The problem is that we are beginning to see the effects of conflicts in use of coastal waters and coastal lands. This is a result of

everybody who is interested in the seacoast "wanting to do his thing" - to use that contemporary jargon - that is, the real estate interests in developing housing, industrial development, navigation port development, commercial fishing, sport fishing, recreation, and finally, waste disposal.

What we are discovering is that the coastal zone does not have the capacity to make it possible to do all of those things without the one inadvertently hurting the other. We have two problems, therefore.

The first is to collect the ecological intelligence or information about how sensitive the coastal environment is to the various modifications that man would deliberately or accidentally impose on it.

The second problem is that of providing legal and administrative apparatus so that we can zone the coastline and help the States to balance the different uses and develop a plan that would assure effective use of what is a very scarce resource.

This is a new function for which no existing agency of Government is completely prepared. It is not simply a matter of water pollution. I know there is a body of belief that this question of dealing with our coastal problems would disappear if we had simply clean water. I do not agree.

That is an important starting point, but my belief is that even if we were able to correct the pollution, we would still have the problems of conflicting use which will have to be dealt with, both in terms of the understanding of the ecology and in the mission that will be necessary by public decision-making bodies in deciding in the public interest who uses the coastline. (p. 96)

[Wenk quoted below from: Hearings, House MM&F, 11-1-71]

In that competition [for coastal resources] there is a fundamental conflict between use and conservancy, for we seem rather helplessly to respond to claims motivated by short-term advantages to individuals, industry, or local government. No one speaks for the next generation, while the shoreline is being consumed.

There is an equally inflamed conflict among the different industrial and commercial uses themselves, because everybody wants to do his own thing. As a consequence of our neglect, early entrenched users preempt later, equally legitimate demands.

In the absence of planning, we have an anarchy of first come, first served. Added to this complex mix of uses is a confused tapestry of public and private ownership.... (p. 395)

While most States have been keenly aware of these issues and their responsibilities, there are a number of reasons why the States did not act - lack of concern, lack of a single administrative focus, ineffectual legal control, lack of funds. In the past few years, several have taken the initiative to protect what should be regarded as a public trust, with courage and with boldness. But others have been waiting for Federal leadership to set standards and to bolster their positions in holding off the entrepreneurs who readily seduce local units of government with the expectations of an expanded tax base which is often their main source of revenue.... (p. 396)

...the question might be raised as to whether or not the present level and balance of coastal research now being performed in the Federal Government is adequate to meet these needs, and moreover, whether or not the results are available to the State governments that ultimately have to make the decisions.

I believe that a careful analysis might suggest that there are large stretches of our coastline for which data are very skimpy, for which there is no environmental monitoring, and therefore, there is no factual basis available for the type of coastal management called for by the policy of the bill itself. (p. 399)

Whittington, Dick, P.E., Director of Field Operations, Texas Water Quality Board, "Coastal Water Quality"

[Whittington quoted below from: Galveston Conf., 6-16/17-70]

Within the time allotted, it is apparent that I cannot in any definitive sense convey to you the water quality conditions existing within the coastal waters. I would, however, like to go over briefly with you our findings up to this point.

...The poor water quality in the Naches River Estuary is primarily that of oxygen resources, excessive temperatures, and at times the presence of excessive quantities of oil.... The waters of the Houston Ship Canal are not in compliance with the Texas Water Quality Standards as they relate to bacteriological quality and oxygen resources. It would appear that the violations with respect to bacteriological quality are largely attributable to domestic sewage discharges... The problems in the Houston Ship Canal are compounded by the unusually rapid expansion in population and industrial development... (pp. 64-65)

Williams, Clarke, Research Administrator, Marine Resources Council of the Nassau-Suffolk Bi-County Regional Planning Board, New York, "Planning for Coastal Zone Management by Nassau and Suffolk Counties of Long Island"

[Williams quoted below from: N. Eng. Conf., 4-28/29-70]

A number of problems were identified by the [Nassau-Suffolk Oceanographic] Committee in its report, The Status and Potential of the Marine

Environment. This report documented the present economic value and the future potential of the marine resources of Long Island; both the direct commercial aspects and the more subtle non-commercial indirect aspects were considered. If Long Island is to grow as a desirable and attractive place in which to work or live, the present trend toward the deterioration of the estuarine and shore environment must be reversed. The report identifies factors such as dredging, land fill, and pollution by human, industrial, and agricultural wastes leading to environmental degradation. The report also noted the need for a much greater knowledge of the marine environment before such problems can be solved... (p. 76)

The bulk of the problems common to all coastal zone areas seem to arise from the effect on the environment of the activities of man, particularly in areas of high population density, or as a result of natural phenomena that have an adverse effect on various human activities. Examples of this latter type are the problems of beach erosion and stabilization;...the shoaling of inlets;... and the growth of aquatic plants. While the existence of such phenomena is well known, there are still some gaps in our knowledge as to the best way (if any) to prevent them.... In the case of human activities adversely affecting the environment, we have problems such as the destruction of wetlands by fill from dredging for real estate development, by dumping of wastes, or by sand and gravel mining operations.... (p. 77)

Currently, at the western reaches of Long Island's marine areas (which are typical of a marine shore interface where an essentially urban culture exists) probably the greatest problem is that of pollution from various man-made sources and disposal of waste. We need to know how much sewage or industrial waste the various areas can handle and how it must be treated to be safe for fishing, for swimming, or just pleasant boating. Are there other ways of handling it? Is some of it beneficial? The same questions arise in connection with the location of power plants and other installations discharging heated water.

On eastern Long Island, there is more of a problem from farm runoffs of pesticides; herbicides; and fertilizers; their effects on algal growth; and the resultant effect on fish and wildlife.... The great variety of the marine environment of the 1,000 miles of Long Island's shoreline and the many conflicting demands for its use (including the conflict of the varying jurisdictions of over 100 different governmental entities) pose an extremely complex problem; the knowledge needed for its solution is incomplete and inadequate. (p. 78)

Wise, Harold F. & Associates, Intergovernmental Relations and the National Interest in the Coastal Zone of the United States, prepared for the Interagency Committee on Multiple Use of the Coastal Zone, National Council on Marine Resources and Engineering Development, March 1969

It has been noted that State legislation concerning coastal areas is piecemeal; further, the legislation has responded to particular

problems such as ordering the exploitation of mineral resources, conservation of fish and game and so on. Thus, the administrative structure found in the Coastal Zone is equally fragmented and highly functionalized. There is usually a myriad of governmental agencies--departments, bureaus, special districts, public authorities and commissions--each attempting to manage the resources in the light of their own legislative mandates. In some instances, legislative policy and agency implementation acted counter to other State policies. The most frequent conflicts were reported between economic development functions and conservation functions.... (p. 44)

Another section of the questionnaire ["sent to the directors of State planning or equivalent officers in the thirty States and the District of Columbia having territorial involvement in the Coastal Zone"] asked the respondent to list the Federally-sponsored research being conducted in the State. The answers were either incomplete or nonexistent. It was made clear, in the interview States especially, that the central planning offices were not aware of many of the Federally-funded research projects going on in the State and were concerned about it for a number of reasons. They felt that this disjointed activity results in:

- an inability to guide or coordinate the research for concentrating on priority problems;
- lack of dissemination of the findings; and
- inability to utilize the findings in the state planning process.... (p. 58)

The States were asked to identify and comment on the most immediate problems and most urgent policy needs facing their State in regard to allocating coastal resources. The response was disappointing with only a few States addressing the question. The observations of the States ranged widely in both responsiveness and relevance:

- Minnesota commented that agencies of State and local government, concerned with the Coastal Zone, were presently working together very effectively and no legislation or policy changes have been recommended.
- Both Washington and Michigan identified a highlighted concern for the development of a planning mechanism for considering competing demands for coastal resources.
- Washington also suggested that State legislation was needed to tie together the presently fragmented State coastal activities into a coordinated conservation and development policy.
- Ohio reported a need for a definition of the limits of State-owned submerged land, a statement of whether or not bays and river estuaries are included, and laws requiring a closer regulation of the use of State-owned submerged lands.
- Georgia indicated a growing general concern for their coastal areas, but neither the identity of specific problems or substantive solutions was offered.
- Illinois indicated that the policies and programs of States adjacent to Lake Michigan be consistent and compatible.
- Indiana reported industrial encroachment and pollution as problems in the coastal area, but offered no policy alternatives.
- Rhode Island indicated conflicting uses of coastal resources as a major problem and reported a need for the legislature to determine State goals and objectives in the coastal areas.

- Michigan also reported a lack of sufficient funds to acquire coastal areas that have long been identified as priority areas for State control.... (pp. 58-59)

Based on the questionnaire returns, the State interviews, the legal search and other materials examined, the following general findings concerning the present State role in the management system of the Coastal Zone were found:

- State statutes establishing distinctions between public and private property and the extent of State responsibility for management of resources in the Zone have little in the way of uniformity. Even if legislatively clear, the distinctions are difficult to fix on the ground. The resulting situation is a legal nightmare....

- State policy and decision-making with respect to the use and development of Coastal Zone resources are, by and large, a conglomerate of separate agency policies made in terms of agency prespectives rather than as a part of a well-defined state role....

- The data being developed as part of many State agency and Federal programs in the Coastal Zone--some of them quite massive--are often duplicating and, worse, not built on the same base so that the findings are comparable among the programs or with accumulated data.... (pp. 64-66)

[Five case studies were undertaken "to determine the effectiveness of a particular coastal mechanism designed and applied specifically in the Coastal Zone."]

Since 1850 the surface area of [San Francisco] Bay has been reduced by 41 percent from the original 680 square miles of marsh, tidelands and water to 400 square miles today. The rate of increase in filling in this period corresponds with the recent nature of growth in the region. Pressure to fill the Bay continues to intensify and should the shallow part of the Bay, listed by the U.S. Army Corps of Engineers as "susceptible of reclamation" be filled, the Bay would measure only slightly more than one quarter its original size. The impact of such filling would extend beyond immediate scenic destruction. Already the ecology of the Bay has been significantly altered. Most of the fill has been in the marshland, the high biological productivity of which is critical to aquatic life. In addition, the capacity of the Bay to absorb the pollution load of the industries, municipalities, and agricultural lands that drain into it has been reduced....

The destructive impact of Bay filling, however, goes far beyond the ecology and productivity of the Bay itself. Continued reduction of the Bay will alter the physical environment of the region by changing vegetation patterns, raising temperatures, and severely intensifying the air pollution problem by reducing air circulation and thereby making temperature inversions more likely....

Massachusetts has over 1,500 miles of coastal and estuarine shoreline and approximately 45,000 acres of coastal wetland. In the Coastal Zone is sustained a complex chain of biological resources and related human uses which play a significant role in the economy of the State.

As in other eastern States with considerable estuarine resources, the wetlands of Massachusetts have become increasingly subject to pressure for fill and development. While the annual rate of wetland destruction has been less than 1 percent of total wetland area, the constant increase in the number of permit applications indicates that this rate is accelerating rapidly....

[Florida] State policy with respect to the Coastal Zone has favored waterfront development, at least until recently. The Trustees of the [Internal Improvement] Fund--[comprised of the Governor and all members of the Cabinet, in which title to all sovereignty and submerged bottom lands is vested] followed a policy of virtually unrestricted grants of submerged bottom lands to individuals and corporations.... The biological productivity of entire bays and estuaries has been destroyed in this widespread sale of cheaply priced State-owned land and its conversion to lucrative waterfront estate.

In addition to this basic problem of unrestricted filling, the coastal wetlands have been subjected to the destructive impact of flood discharge canals running to tidewater. Ground runoff discharged by these canals significantly alters existing levels of salinity and thereby upsets the ecology of many estuarine areas....

Though no single problem predominates in the Nassau-Suffolk Area [New York], pollution plays a more significant role than in most other coastal areas. Here pollution is a two-way phenomenon. An overdevelopment of the ground water systems has lowered the fresh water table and led to salt water encroachment. The problem is compounded by contamination of the sub-surface fresh water by domestic waste discharged through cesspools and septic tanks. Contamination is extended into the coastal waters through ground runoff, direct seepage from cesspools, discharge of inadequately treated sewage, and the dumping of raw sewage by the increasing numbers of small craft in the area. As a consequence of this pollution, public bathing is prohibited on 11 beaches in the Nassau-Suffolk area and more than 10,000 acres have been closed to all fishing....

Destruction of wetlands is another major problem.... As distinct from Florida and most other coastal states, the fundamental cause of wetlands destruction on Long Island is not real estate speculation and development but extraction of sand and gravel.... A contrast to the incremental destruction caused by pollution and dredging is provided by the spectacular damages resulting from periodic storms and high tidal flows along the Coast....

Maine, by virtue of its precipitous coastal topography, geographical location, and rigorous climate, has not faced the intense pressure for shoreline fill development experienced by the more populous states to the south.... Pollution of the coastal region, rather than dredging and filling, appears to be the focus for concern in Maine.... A current topic of considerable concern...is the proposed construction of a major oil refinery.... Opponents of the plan are urging that strict controls be provided to prevent pollution by oil discharges in the coastal waters... (pp. 104-105)

Wright, James, Executive Director, Delaware River Basin Commission, "Summary of Current Conditions, Delaware Estuary"

[Wright quoted below from: Hearings, Sen. Comm., 4-21-70]

The threat to the region is still concealed from the untrained eye. No popular alarms have been rung. Because it is predominantly undeveloped, the environment of Delaware Bay itself and its immediate shoreland areas remain for the most part of high quality.... The region is not yet encumbered with the staggering environmental problems of, say, Lake Erie, San Francisco Bay or New York Harbor. The crisis of the Delaware Bay Region lies within a different dimension. It is the crisis of time: the short period that remains in which to prepare the region to cope with the forces of change that now are clearly evident. (p. 1101)

Proximity to a major world port and to the huge markets of the Boston-Norfolk urban corridor, large areas of undeveloped and relatively inexpensive land, good harbor potentialities, and large volumes of high quality water all point with certainty to accelerated development of the Bay Region and to intensified pressure on natural areas and open spaces between Philadelphia and the Capes.... The forces of change are accelerating now as urbanization extends into the region.

Highways and mass transit systems steadily tie the region more closely to surrounding areas.... Many of the industrial promotion efforts in the State of Delaware are directed toward water-based industries.... Nuclear generating stations will follow as the search for large volumes of cooling water leads naturally to the Bay. That this trend will affect the thermal characteristics of parts of the Bay can hardly be questioned. Population of the counties surrounding the Bay has been increasing at a rate about twice that of the four-state Delaware River Basin as a whole.... Further accelerating population and residential growth, particularly in those communities near the Bay, will be the continuing trends of increased leisure time and income, both of which strongly stimulate water-based recreation of all types....

[Deepening of the C. & D. Canal] and other events will change water quality characteristics in the Bay Region, particularly the salinity balance.

Greater risks to water quality will come from growth of the petroleum industry... Oil spill hazards will increase.... Pollution and destruction of wetlands have reduced the value of the water of the upper Bay Region for conservation and recreation uses....

Land use around the Bay...proceeds but without reference to any overall plan and is subject to competition of increasing tempo as the forces of preservation respond to the forces of development and change. (pp. 1101-1103)

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